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The Institute of British Foundrymen
The Institute of Vitreous Enamellers
The Welsh Engineers' and Founders' Association
The Foundry Trades' Equipment and Supplies Association

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British Cast Iron Research Association (affiliated).
British Grit Association (affiliated).

Planning for the Future

It is becoming more obvious every day that peace will see the dawn of a world different in many respects from that which we knew in 1939, and just as it is essential to concentrate on the war effort at the present time, it is equally incumbent on the manufacturer and scientist to give some thought, now, to helping along his country under what may well be new and strange conditions. Profound in their effects are facts that for the first time in history the bulk of the population has been forced to take meals regularly away from home; home life has been broken up by mobilisation and evacuation; country and town life has been inextricably mixed up, and much property has been destroyed. Moreover, there has been an incredibly levelling up and down of incomes, and a better appreciation of true quality in goods. The newly-acquired habits of the people will call for a reorganisation of the kitchen and to the existing laid-on services of gas and electricity will be added that of a communal hot-water supply, and, maybe, in place of the open coal-fed grate, central heating. This will have a profound influence on the light-castings industry, for they will encounter a demand for heavier types of stoves and boilers such as they are now making for canteens and larger buildings, as not only will these be required for the new domestic apartments, but also for innumerable restaurants which will come into being to cater for a nation which has learnt to "dine out."

Export trade is bound to be controlled for a long period, the Board of Trade in consultation with the Export Groups deciding the types of goods to be sent abroad for the major benefit of the country as a whole. Here, initially, the foundry should be busy, as, unlike most other industries, practically the whole of its raw materials are indigenous. The return cargoes will bring in urgently needed goods for the resuscitation of industries built up on imported raw materials.

The farming community is promised continued prosperity for the future and attention given to a market filled with more discriminating buyers than those of the city will be well repaid. It is quite wrong to imagine that the farmer or his labourer highly esteems his picturesque Tudor cottage; he prefers, and is insistent in his demands, a villa of modern construction and equipment which will relieve his wife of at least some of the arduous labours to be associated with the running of a farmhouse. The pig troughs and plough points, so long conserved as the perquisites of the country jobbing foundry, will find themselves being quantity-produced in large-scale establishments. There must be a quick revival and expansion of the vitreous enamelling industry, as an important section of ironfounders rely on this medium to supply users with a durable and pleasing surface. The executives of this industry would do well to prepare in advance the schedule of their raw material requirements so that there may be a minimum of delay in supplying finished goods of impeccable quality, not to be expected from *ersatz* mixtures.

The competition which the light-alloy foundries, forges and mills will make against the ironfoundry has been the subject of previous editorial references and some time will elapse before each will establish supremacy in its own particular market. Only too frequently we wonder if the light-alloy foundry industry is paying as much attention to the organising of the firms embracing its industry as it is to a study of post-war developments. Adequacy in the latter direction may easily be rendered abortive by the chaos resulting from lack of employer collaboration.

For the steelfoundries, the same position will arise as after the last war, that is, there will be an excess capacity, but the major difference will be that, unlike the last post-war era, there now exists an enlightened, intelligently conducted employers' association. It will need much goodwill and not a little sacrifice to steer this industry successfully through an inevitable period of contraction.

Finally, it will be the arduous duty of the technicians of the industry to reinforce the scientists in their efforts to establish civilised—using the word in the sense of the Atlantic Charter—conditions throughout the world. Sir Henry Dale, in his presidential address to the 279th meeting of the Royal Society, has very rightly insisted that although the statesmen intend calling upon the scientists for help, the latter must remain "in complete independence of the State." That is at least one fundamental, established for post-war conditions, and contrasts sharply with the prostitution of science and scientists by the Axis powers.

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Book Reviews

"Knotted String: An Autobiography of a Steel Maker." By Harry Brearley. Published by Longmans, Green & Company, Limited, 43, Albert Drive, London, S.W.19. Price 10s. 6d. net.

Since student days, Harry Brearley has been the subject of a good deal of hero worship by the reviewer, and this feeling of sincere admiration has been shared by most contemporary metallurgists. It is thus most disappointing to have to write that the publication of "Knotted String" has done little to add to Brearley's reputation as a writer, and much to detract from his status as a research metallurgist. His previous book, "Steelmakers," received general approbation and had "Knotted String" stopped half-way through similar commendations would have been accorded—at least, from this reviewer. Whilst Brearley is recounting his early life in the slums of Sheffield, his meagre schooling, his work as a bottle washer, laboratory assistant and as a technician in Riga, he well retains the interest of the reader. From this point onwards deterioration sets in and the raising of a controversy as to whether the credit for the invention of stainless cutlery steel should go to Brearley or Firth's Steelworks is as unnecessary as it is boring. On his own confession, he used a number of pseudonyms for a newspaper campaign, whilst indicating that his adversaries were not sportsmen! (pp. 138 and 139). Few interested parties can forget Brearley has deposited a sealed envelope with the Cutlers' Company to be opened in the dim and distant future, which is to disclose details of his discovery of stainless cutlery steel. Surely, after the publication of this book, the event of its opening will be told as a story, a few inches long, well inside the daily papers! There is no disclosure in the book—and it can be presumed that the book is meant for the man in the street—that there are several types of stainless steels and that the author is the inventor of one of them. By publicity of a better type than is revealed by this book, his name might have gone down to posterity as the inventor of the fundamentals of "stainless" steel. The "baby" Bessemer, the side-blown Bessemer, the basic Bessemer were not Bessemer's inventions, but the general public are neither aware nor particularly interested in names which did so much to enhance the value of Bessemer's pioneer work. Put bluntly, there is not sufficient of the glamour of romance about the discovery of stainless cutlery steel to fire the imagination of *hoi polloi*, as is to be associated with Bessemer's invention or the casting of Cellini's masterpiece. As for the metallurgist, he will, after reading this book, be inclined to think that routine investigations would not have delayed by many years the production of stainless steel cutlery. The reviewer feels that he would like to forget the existence of this book and replace Brearley on that pedestal of admiration which that great savant has occupied for so long in his mental gallery of distinguished friends.

V.C.F.

Compressed Air Terms and Standards. Published by the British Compressed Air Society, Boreas Works, Beddington, Croydon. Price 2s. 6d.

Whilst this book contains many features of interest to compressed air users, it is also very helpful to those engaged on the manufacture of compressors. Foundrymen enter very largely into both classes, and much information as to amount of air required to drive four types of sand rammers, portable grinders, bath enamellers, spray guns, shot-blast jets, sand riddles, hoists, and fettling vices is distinctly useful in correlating requirements with available power. There is also included the British standard method for the measurement of air flow and the free air delivered by compressors. Lubrication is dealt with in several places, and its importance cannot be overstressed. This publication will be welcomed by a large number of our readers.

Improved Efficient Use of Fuel

At the request of the Mines Department, a series of meetings has been arranged jointly by the following societies: Institution of Civil Engineers, Institution of Mechanical Engineers, Institution of Mining Engineers, Institution of Electrical Engineers, Institute of Chemistry, Iron and Steel Institute, Institution of Gas Engineers, Society of Chemical Industry, Institution of Chemical Engineers, Institute of British Foundrymen, and the Institute of Fuel and others. The object of the meetings is to inaugurate an open discussion on the best ways and means of improving the efficient use of fuel and power in existing industrial plants under present conditions and to invite constructive suggestions. The first meeting is to be held on Tuesday, December 16, at 2.30 p.m., in the Large Hall, College of Technology, Sackville Street, Manchester. The chair will be taken by Sir Robert Burrows, J.P., chairman of the Lancashire Associated Collieries, Limited. Dr. F. S. Sinnatt, D.Sc., F.R.S., the Director of Fuel Research, and member of the Fuel Efficiency Committee of the Mines Department, will initiate the discussion. Members of the Institute of British Foundrymen are invited to attend this meeting.

Publications Received

The Anti-Glare Screening of Cupolas—A Review by L. W. Bolton. Published by the British Cast Iron Research Association, 21-23, St. Paul's Square, Birmingham, 3. Price 1s. post free.

This publication, which is available only to British foundries for their private information and use, embodies the experience gained from a lengthy period of wartime conditions and can be deemed to be the last word on the subject. The reviewer is pleased to see that the price has been kept at the very reasonable figure of one shilling, for there has been a tendency to ask too much in recent times for similar pamphlets. This authoritative report should be in the hands of every foundry manager in the country.

Foundry Practice—Reading List, 1941-42. Published by the Sheffield City Libraries.

Whilst the foundryman located in the Sheffield area is fortunate in having such a comprehensive library service at his disposal, as is revealed by this list, it is somewhat disconcerting to observe certain outstanding omissions. For instance, the new classical book, "The Metallurgy of Iron," by Prof. Thomas Turner, and the current standard work, "The Metallurgy of Cast Iron," by Dr. J. E. Hurst, are apparently not available. However, the object of a list is to say what is available and not what the Chief Librarian would like to place at the disposal of the citizens. A list of new books recently added to the Science and Technology Library has also been included.

Institute of Vitreous Enamellers

The meeting of the Southern Section of the Institute of Vitreous Enamellers scheduled to be held last Saturday at 49, Wellington Street, W.C.2, was postponed and will be held on December 13 at 10 a.m. at the same address. The raw materials used in the vitreous enamelling industry will again be under discussion.

Random Shots

A correspondent from South Wales is agitating for the compilation of a glossary of foundry terms. This, however, must be taken as a suggestion for the "Peace Programme," for at the moment all workers in foundries are too busy making castings which will help to win the war to bother about the meaning of the words they use, whilst the administrative staffs would feel happier with a dictionary of official terms to help in their daily struggle with governmental documents.

* * *

As a proposition for more leisurely days to come, however, "Marksman" can think of no pleasanter occupation than that of delving into the curious foundry customs, phrases and words used in various parts of the country. The suggestion which comes from South Wales is the outcome of a discussion on the meaning of the word "mearl," which seems to be quite a local term. Apparently, in that part of the world, when the face of an ordinary clay bond mould breaks away, the sand then runs or is said to "mearl." This does not happen in an oil sand mould.

* * *

Another interesting term is that of "mapping," which does not seem to be known in every part of the country. This is applied to the markings which appear on the surface of a casting, caused by the filling up of the cracks in a loam mould.

* * *

Then there is that expressive word for slag known as "scruff." This has nothing to do with the popular phrase of irate fathers when they wish to eject miscreant sons from the room, but is related to its other meaning of a thin crust or coating. There is a suggestion that it is borrowed from the tinplate industry. Incidentally, the word "scruff" was often used contemptuously as a term for money; but not recently, for it is a long time since anyone could afford to talk contemptuously of money!

* * *

Such a compilation would, of course, include peculiarities of pronunciation and would record the Southern rendering of the word "cupola," for the Cockney foundry worker invariably calls it a cupolos. It is thought that this is derived from the French "*cubillot*." In this connection it is interesting to note that in any similar work in France, an alternative word for *cubillot* would be given as "*le four* Willkinson," which is still used in some French foundries.

* * *

One good thing the war has taught the people of this country is how to be profoundly thankful for small mercies. A woman, whose home had been destroyed whilst she was in hospital, was heard to remark the other day that she was living very comfortably now, in spite of everything. The hospital almoner had found her a very pleasant room to come home to, and, thank God, she still had an armchair and a wireless! What more could a body need after a hard day's work?

* * *

The pundits say that paper is twenty tons per square inch material; the Controller of Salvage, however, will be content with ten tons per foundry. Foundrymen will realise that the Salvage Department is the appropriate Government department for receiving unwanted demand notes and other undesirable mail, and is, in fact, urgently needing this form of literature as well as masses of other paper products, both printed and plain, for conversion into a hundred and one products needed by the Armed Forces. Is there an easier vital contribution to the war effort than throwing out the masses of old papers and books we all accumulate?

"MARKSMAN."

Recent American Developments in Cast Iron

Discussion of DR. A. B. EVEREST'S Paper* by the London Branch of the Institute

In introducing Dr. Everest prior to reading his Paper before the London Branch, the BRANCH-PRESIDENT (Mr. R. B. Templeton) paid tribute to his great ability and his willingness at all times to serve the industry. In addition to his own work on behalf of his company, he was a member of various Committees of the Institute, and served also on the Technical Advisory Committee appointed by the Director for Iron Castings in the Ministry of Supply.

Lack of Co-operation

That reference led the President to draw attention to a recent letter in the FOUNDRY TRADE JOURNAL, written by "A.M.I.B.F.," concerning certain tendencies to preserve secrecy among members of the industry. One felt very angry, he said, that a state of things such as had prompted the writing of that letter should exist, and it was interesting to read the very adequate reply by Dr. Everest, which was published in the FOUNDRY TRADE JOURNAL for November 6. It was deplorable that anyone in the industry should not take full advantage of the facilities afforded by the various advisory and technical committees to give and gain information of value to the industry and the country. Any ironfounders having such a parochial outlook that they guarded as secret, their knowledge of the making of certain castings successfully, could only blame themselves if their businesses were taken over by the Government. It was of the greatest importance that, especially in time of war, those engaged in the industry should make information available to each other, in the interests of themselves, the industry and the nation as a whole.

In opening the discussion on Dr. Everest's Paper the Branch-President commented on the possibility of reduced costs through the adoption of austempering for cast iron.

"S" Curves

MR. V. C. FAULKNER (past-President), discussing the problem of inoculation, said he gathered that speed was essential; it seemed necessary to cast very soon after inoculation. He asked whether plant had been installed in this country for the "austempering" or the isothermal treatment of cast iron. Such treatment was being applied here to steel. Finally, he said that Dr. Everest's remarks had given him a better appreciation than he had had before of the "S" curves, and he looked forward to a closer study of the subject.

DR. EVEREST replied that the "S" curve theory was explained in the Paper by Flinn and Reese, which was most fascinating. Endorsing Mr. Faulkner's remark with regard to the importance of casting soon after inoculation, he said it was recognised nowadays that when cast iron was inoculated its ability to form the required type of graphite, conferred by the inoculation, faded away within a short space of time. It was necessary, generally, to cast within 10 or 15 mins. after inoculation. He did not think the isothermal treatment of cast iron was being practised in this country yet.

Dry Blast for Cupolas

MR. A. LOGAN (past-President, Newcastle Branch) said he had been impressed by the growing worth of American research on cast iron. It was a somewhat remarkable tendency, and he had been rather at a loss to find a reason for it. It was true that uniformity meant the maintenance of quality; indeed, the whole object of foundry control was to secure uniformity and to be able to maintain the production of good quality castings.

Another factor which had impressed him was the amount of attention which had been devoted to the pre-drying and pre-heating of the blast to the cupola, and there was a very great need for it. In this country there was a wide variation in the moisture content of the atmosphere as between the different seasons and even from day to day, and with those variations of the condition of the atmosphere there were differences in the operation of the cupola; so that that factor was also important in securing uniformity of product. Founders in this country were bound to devote a great deal more attention to it, and in the near future members might hear of foundries adopting the pre-drying and pre-heating of the cupola blast.

With regard to the point that the carbon pick-up was high when the moisture content was high, he said he had not previously appreciated this fully, but it seemed quite likely. He asked what were the reasons for it, and what was the extent of the extra carbon pick-up as the moisture content increased.

Discussing superheating and inoculation, he asked for some elaboration of the point that the higher degrees of superheat did not confer improved physical properties. Those who studied cast iron, he continued, must be intensely interested in graphitisation, which was another factor closely concerned with control. In the course of some work on the subject some years ago he had rather gained the impression, though he could not positively confirm it, that it was quite possible to have two cylinder irons, for example, each containing 3 per cent. of graphite by weight, but whereas in the one case that 3 per cent. by weight represented 10 per cent. by volume, in the other case that 3 per cent. by weight might represent much more than 10 per cent. by volume. He asked for Dr. Everest's comments on that matter.

In the course of the work to which he had referred, he could not be quite certain that the sizes and shapes of the graphite flakes as seen under the microscope—with their resulting area and computed volume—correctly represented the graphite as existing in the structure. Nowadays, with the improved polishing technique available, one could be much more certain. He had not had an opportunity of reviewing the matter recently, and the impression he had formed earlier might not be justified. The point was important, as, if correct, it would indicate a possible variation in the specific gravity of the graphite, or some gas reaction or gas liberation coincident with graphitisation.

Superheating and Graphitisation

DR. EVEREST, replying to Mr. Logan's question as to the incentive for the great amount of research work on cast iron in America, said that in the first place the industry in America was backed by an extremely active Association. The latest issue of the house organ of the American Foundrymen's Association contained the lists of the committeemen appointed for the ensuing year. There were about 90 committees, and the list of names of the members of those committees filled many pages. Thus, the work was distributed among a great many extremely enthusiastic people. That enthusiasm had spread, obviously, to those who were studying for higher degrees at the universities, and that explained some of the university work. Further, there appeared to be competition between the various research institutes to turn out the best work. In the past, perhaps, the public had not given a great deal of attention to some of the American work; but the quality of such work had improved enormously during recent years as to warrant intensive study.

With regard to the control of moisture content in the blast to the cupola, he said he had seen the Paper which dealt with the subject and the main conclusion was that the carbon pick-up increased with increased moisture content. Surely, he continued, the fundamental principles in regard to the blast would be the same in cupola practice as in blast-furnace practice, and he knew that the silica gel process was used in this country for the drying of the blast in blast-furnace practice. No doubt the Papers which had been presented to the Iron and Steel Institute in this country would throw light on the subject. The broad idea was that, in the burning of a certain weight of coke, if a large proportion of moisture in the blast had to be heated and evaporated, that represented waste of heat. The result, therefore, was to slow up the rate of melting, and the charge was in contact with the coke for a longer period, so that there was increased carbon pick-up. That explanation might be right or wrong, but, at any rate, it had the merit of being simple.

With regard to superheating, he said the point was that if there were any graphitising tendency or inoculants present in the molten iron, whether they were there initially as added inoculants or whether there was some tendency inherent in the metal itself, then, as superheating proceeded, that tendency was suppressed; so that the higher the temperature to which the material was superheated before casting, the greater was the tendency to under-cooling, and the under-cooled structures were the iron carbide structures, which broke down to grain boundary graphite. In those weaker structures the inoculation effect had been wiped out by superheating.

Discussing Mr. Logan's reference to graphite standardisation, Dr. Everest said that in the A.S.T.M. specification a method of polishing specimens was recommended. He suggested that possibly the effect which Mr. Logan had noticed, where a given graphite content by weight might appear to represent different percentages by volume in different irons, might be due to the fact that, in the course of polishing, relatively large holes were torn in the metal surfaces, and those surfaces appeared to contain more graphite than in fact they did contain. The leading exponents of the art of polishing were the workers in the British Cast Iron Research Association, and in their excellent work they had shown that the black spots that appeared on the surfaces were not necessarily all graphite flakes.

American Technical Progress

MR. V. DELPORT (past-Branch-President), confirming the remarks of Dr. Everest concerning the great attention given by the American Foundrymen's Association to cast iron research, pointed out that the interest shown by the Americans in cast iron research was not new. The Transactions of the Association covering quite a number of years showed that at the Annual Conventions of the Association year after year there were presented anything from 20 to 40 Papers, mostly devoted to cast iron, sand, and so on. Perhaps one reason why it had been thought that the quality of the Papers presented in the past was not so good as it might have been was that the quantity was so considerable. Out of 40 Papers there might have been only half-a-dozen which were really

*See "Foundry Trade Journal," December 4, 1941.

American Cast Iron Developments

outstanding. Again, only comparatively recently had some of the research work of the past 20 years or so begun to yield interesting results; that work was giving nowadays data on matters which were not even thought of 20 or 30 years ago—and, indeed, that was true also of other countries, including Great Britain.

Relative Value of Graphitisers

MR. E. M. CURRIE said he had not intended to cross swords with the author, but felt he must do so with regard to the use of calcium silicide and the wearing off of the effects of ladle graphitisation within a comparatively short time. He believed that the Paper referred to by Dr. Everest, on the effects of ladle inoculation, was one published by the A.F.A. quite recently, and he had gathered from that Paper that the work described was done with ferrosilicon and not with calcium silicide. Apparently the experiments were made on very low carbon irons, containing from 1.74 to 2.37 per cent. T.C. Ferro-silicon was found to be more effective in those irons of low total carbon content than in those containing about 3 per cent. T.C. It had also been found that low silicon contents were necessary in low-carbon irons in order to avoid weak dendritic structures. Again, with regard to the statement that the "inoculation" effect wore off after the ladle had been standing for from 15 to 18 mins., he said he had not specially attempted to find out whether that was strictly true, but he had rather gathered, from his own experiences, that very different effects were obtained according to the types of graphitisers used. The graphitisers included silicon, nickel, zirconium, calcium silicide, and so on. There was a tendency for the effect of graphitisation with silicon to be irregular. Test ladles taken from the top and the bottom of the main ladle showed different results. He had not, however, found so great a difference when using calcium silicide; and he imagined that the effect of nickel on graphitisation would not be variable to the same extent as that of silicon.

Pearlitic Malleable

The use of pearlitic malleable appeared to be extending in America, and some extraordinarily interesting results had been achieved. In this country we were merely playing with the idea so far; but for the ordinary grey iron foundry, making the hard, white type of iron, it appeared to be an extremely interesting and useful field of experimentation. Recently he had seen one of these pearlitic malleables produced in a grey iron foundry without any real difficulty at all. The total annealing time was 26 hrs., and the iron produced gave about 22 tons per sq. in. tensile, 5 per cent. elongation and, using a test-bar of 1-in. dia., gave an Izod impact value of 120 ft.-lbs., which was exceptionally high.

From a report he had received of a recent foundry meeting it appeared that many present had boasted of the poor quality materials they had used to produce exceptionally good high-duty irons. He hoped that that impression would not gain ground in this country, lest there should be a repetition of the experience of difficulties such as had occurred in another connection about the period 1923-25; at many foundry technical meetings in the Midlands at that time people had boasted about the very low coke ratios they had been able to adopt for melting iron, and in his opinion they had caused a great deal of harm in the industry.

Ladle Metallurgy

There had been some interesting developments in America concerning ladle metallurgy, involving the use of materials known as Chrome-X, Silicon-X and Copper-X. There was quite a field for interesting experiment in that direction, because by such additions one could produce small quantities of high-alloy irons in a simple way. In one report it was stated that, to a 200-lb. ladle, there was added about 5 lbs. of Copper-X, 8 lbs. of Chromium-X, and 23 lbs. of Silicon-X to produce contents of 1½ per cent. copper, 2 per cent. chromium, and 4½ per cent. silicon. The percentages recovered were remarkable, being about 85 per cent. of the copper, 77 per cent. of the chromium, and 99 to 95 per cent. of the silicon. The temperature rise at the end of the operation was of the order of 25 to 30 deg., instead of the usual temperature drop when adding normal ferro-alloys.

Influence of Time on Graphitisation

DR. EVEREST, replying to Mr. Currie's question concerning inoculation, said that Boyles and Lorig in their Paper had described how they had inoculated a bath of iron and had made the first cast 2 mins. after inoculation, and then had held the metal in the bath for half an hour before making the second cast; in that experiment they had used calcium silicide. Eash had not used calcium silicide, but had used combinations of silicon and nickel; Dr. Everest said he had only quoted the conclusions arrived at by Eash concerning the effect of under-cooling. It was still rather difficult to discuss the mechanism of inoculation, but he believed that a low-carbon iron required inoculating more than a high-carbon iron in order to ensure avoiding dendritic graphite.

MR. CURRIE said the basis of the original work on the high-tensile irons was to work with a low-carbon, low-silicon, iron which would ordinarily cast white, but to inoculate it and so to throw it over to the graphitic condition in order to produce the improved properties.

DR. EVEREST was not sure that that was altogether the explanation. He felt that the Paper from the Battelle Memorial Institute, on under-cooling, referring to the shape of the graphite flakes rather than to a composition which would be classed as that of a hard iron, gave a little more information on the strength of high-duty irons. One found only too often that two irons of similar composition gave totally dissimilar physical properties. The Battelle Institute workers had experimented with an iron of about 3 per cent. carbon, 2.2 per cent. silicon, and 0.7 per cent. manganese, with and without graphitisers. Both samples began to freeze at about the same temperature, 1,100 deg. The eutectic freezing point was about 1,130 deg., and the rise of temperature in the processed sample was less than that in the un-processed. There was something in that question of the reduction of the latent heat and its effect on the micro-structure. The un-processed iron seemed to give the graphite in rosette form, whereas the processed iron gave it in randomly distributed form. There was probably a greater field for exploration among those micro-structures than had yet been realised.

Effect of Temperature

MR. C. H. KAIN (past-Branch-President), referring to his personal experience of inoculation or ladle processing, said that the effect of the inoculation or processing did wear off, but much more rapidly at high temperatures than at low temperatures. Therefore, when discussing ladle processing, it was most important that the temperature of the iron should be stated. He asked whether any information had been published recently concerning the fluidity or flowing power of the processed irons, because that property varied tremendously. That again was closely allied with the question of temperature; but, in his experience, the irons treated with metallic silicon tended to become very sluggish or, in other words, to lack fluidity.

With regard to the "S" curves, he said he understood that a little work had been done in this country on that very interesting development, in respect of both steel and cast iron. It was well worthy of close study, and he asked if Dr. Everest would confirm that the work mentioned had referred entirely to irons which had been heated to a high temperature and were being cooled or quenched, *i.e.*, that it referred to cooling curves and not to heating curves.

Discussing superheating and its effect on structure, Mr. Kain commented that insufficient attention was given to the conditions following superheating. If the pouring temperature of the iron rose much above the freezing point, the cooling conditions surrounding the test-bar from which the results were taken, on the casting, varied tremendously. The problem of the velocity of cooling had not been studied sufficiently. In the course of experiments made some years ago, it was shown that superheating so affected the cooling velocity at various stages that it was possible to produce mixed structures of coarse graphite, supercooled graphite and white iron.

Just before the war the Steel Castings Committee of the Institute was collecting data on the physical properties of cast steels, and had found that the physical properties, particularly the impact values, were increased very greatly by very rapid heating in the normalising or annealing process. He believed Mr. Deschamps had collected considerable data on that matter, but did not know whether or not that data had been published.

Quick Anneal of Malleable

DR. EVEREST, replying to the Branch-President's remarks on isothermal treatment, stated that the chief advantage of this is that it was more foolproof than the ordinary quench and temper treatment. Controlled heat-treatment furnaces for the heating of the materials to a given temperature were, of course, required, and then a quenching bath at a controlled temperature. The equipment and expense involved were therefore not substantially less than for the more normal treatment.

Replying to Mr. Kain's question concerning fluidity of the processed irons, he said there was some information on the matter in the American Papers he had studied, and he would indicate it in the bibliography published with his address.

He believed that the process for the rapid heating of malleable had not yet progressed very much in this country, because of the equipment costs. The equipment, which included a conveyor type of furnace with properly controlled temperature zones, was fairly expensive, and the Americans adopted it only in association with very large production.

Impact Testing

MR T. W. RUFFLE, who commented that Dr. Everest's clear explanation of the "S" curve technique qualified him for appointment to the Brains Trust, asked whether any large-scale work had been done in connection with impact testing.

DR. EVEREST replied that the Americans had been endeavouring to standardise the Charpy test. In the Report of the A.S.T.M., which referred to the work of the various committees of that society on cast iron and other materials, it was stated that Sub-Committee XV, after having studied for some time the drop test method and the Charpy impact test, had concluded that both those methods needed to be standardised tentatively for purposes of research and the accumulation of data for inclusion in future specifications. The Report included details of both tests. Others in the United States had developed a modified Izod test to some extent, but it appeared that they had not continued the work very far, and he believed that attention was being devoted more and more

(*Continued on page* 378.)

The Use of Precast Paraffin Wax*

SOLVES A COMPLEX MOULDING JOB

By H. HOLDSWORTH and P. L. WARD

The job to be described is one with which the authors found themselves at a dead end as far as moulding in the orthodox manner went. It relates to a tube mill trunnion liner 4 ft. 9¾ in. long, the details of which are shown in Fig. 1; one off was required and machined to the sizes shown. The drawing shows a three-bladed type of feed screw, cast internally approximately 13 in. long, each blade or thread running straight for 9 in. outside the bore after taking half a turn inside. It will be seen that this caused, literally speaking, a blank end needing a body core, ending in three twisted prongs. A certain amount of trouble was anticipated with this and allowed for, but the real snag did not reveal itself until the patternmakers got to the point of making the screw. A half core-box was made to carry the screw to enable the moulder to have room to ram in between the blades, the top half being strickled to shape. The best illustration of the screw is of three threads on one bolt, similar to the quick return screw on planing and similar machines, but instead of a thread around a bolt, the three threads merged and rested on each other along the centre. When the first blade was made according to the dimensions on the drawing, it was realised that it would not draw or twist out, for instead of following on as in a true thread, it was elongated, presumably for feed purposes. However, it was taken to the foundry and tried out. Initial fears were proved correct; it would not draw, so it was altered by cutting it into sections until it was in four pieces. Still it did not draw properly, and it was practically an impossibility to fasten these 12 pieces in the box so as to allow the making of the core. The authors searched for a solution but could not find a satisfactory one, so they looked for an excuse to shelve the job for the time being, but were not allowed off the job for long.

In the meantime there had been a meeting of the Branch, at which the members had described to them the art of making bronze statues, etc., in which wax was prolifically used. Was this the solution to the problem? Why not make the vanes in wax and leave them in the core to melt out? The patternmakers made another pattern to the true shape of the thread, and a paraffin wax casting was made. The men proceeded with the other two blades, these were trimmed and placed in the corebox, and the core made as previously stated.

Great care had to be taken as the core had to be made with loose irons. One ½-inch diameter rod was bent carefully to the desired shape, this being used as the template, six in all being required, two in each portion. These were properly placed and supported in position until rammed up with an oil bonded sand, a little extra bond being put in the mixture to ensure a good solid core. The sand packing used to support a core of this type while in the green state, freely absorbed the wax as it melted out during drying. The job was closed and cast in the usual way, resulting in a very satisfactory job, which showed no defects whatever on machining.

This process is not claimed to be by any means unique; it is only a description of a job in which the use of parts of a pattern made of wax helped the authors out of a difficult situation.

Since using this method, the authors have been reminded of a job in which they feel sure considerable time and trouble could have been saved had wax bosses been used. This was a gearbox for a universal milling machine, shown in Fig. 2. The authors are a bit vague regarding the exact shape, which is not of major importance at the moment. The casting had eight internal bosses, four being carried on a web or bracket situated centrally. The method employed was as follows: The box was cut in two horizontally, across the bosses, the half bosses and web bracket being dovetailed into position. The core was rammed up with oil sand, pieces removed, and the cavities filled with old backing sand to prevent collapse when rolled over and the box removed.

If a full box had been used, the bosses would have to have been cut into slices to allow them to be removed by drawing them into the rib to get them out. As these bosses were much thicker than the rib, a strongly bonded sand would have been required, as oil sand would have collapsed after removing the bosses. Had this type of sand been used, it would have taken considerably longer to ram up; also it would be more difficult to remove from the casting. Had wax bosses been employed, it would have been possible to have used a full box and one grid enabling the use of oil sand, and there would have been no fear of collapse; thereby the cost of wax bosses would have been set off against the use of two grids, jointing and fastening the two half cores, provision having been made for bolting by corresponding slots cast in the grids at four points. It is hoped that the description has been clear and the authors will welcome any criticism on this subject.

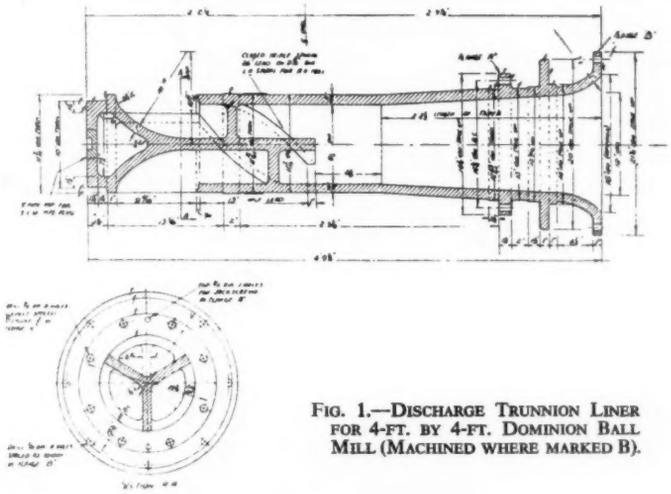
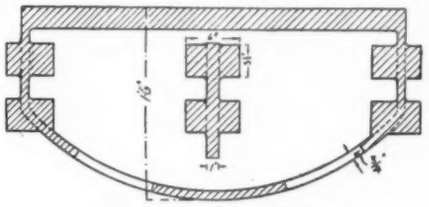


FIG. 1.—DISCHARGE TRUNNION LINER FOR 4-FT. BY 4-FT. DOMINION BALL MILL (MACHINED WHERE MARKED B).



Sectional elevation on A A.

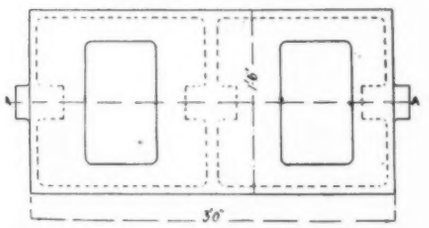


FIG. 2.—PLAN OF GEARBOX DESCRIBED.

DISCUSSION

On the conclusion of the Paper, the BRANCH-PRESIDENT (Mr. J. Tonge) said that members could appreciate the position of the authors when faced with a job of the nature described. Once again necessity had proved the mother of invention, and the industry in South Africa could congratulate themselves on the way in which members of the Branch were prepared to come forward and tell of their difficulties and how they were overcome. He appealed to members not to be backward in bringing forward the questions and suggestions they had to make regarding the Paper.

MR. LION-CACHET said he was particularly interested in the second problem because he had been faced with a similar problem himself. He asked Mr. Holdsworth if he had been acquainted with the wax method when he made the gearbox, and also inquired whether it would be correct to drill a half-inch hole through the corebox and the web and thread of the bosses on the rod, so that there could be a pre-cast hole for centering. This hole could be used as an open passage for the wax when it melted, and would also ensure that the bosses were correctly spaced. Would that be sound procedure?

MR. HOLDSWORTH said that the method suggested by Mr. Lion-Cachet would be very simple. Under ordinary circumstances, when using a wooden corebox, the bosses could be fastened with loose pegs.

MR. TONGE said that Mr. Lion-Cachet's suggestion gave food for thought. The use of wax was very much to the fore in foundry practice. It was the first time that the use of wax had been demonstrated at these meetings.

Replying to Mr. West, who suggested that it would have been possible to have made a ring and welded the supporting rods on to it to give more rigidity to the core, MR. HOLDSWORTH was of the opinion that the method outlined in the Paper was as good as any. It had been given considerable thought and it was realised that the rods could have been stood up and cast in after the grid had been made, and consequently would have had to be twisted in. As it was, the top rod finished at the bottom and *vice versa*, and the method adopted proved very satisfactory as regards speed.

* A paper read before the South African Branch of the Institute of British Foundrymen, Mr. J. Tonge presiding

Use of Precast Paraffin Wax

MR. TONGE asked whether closer co-operation between the engineer responsible for the particular design and the foundry concerned might not have simplified the job.

MR. WARD said that they were given the drawing and had to follow it. He himself had evolved a much simpler design for a similar mill, which had been accepted.

MR. TONGE then pointed out that by simplifying castings, engineers could assist foundrymen considerably.

MR. BRAGG, referring to the gearbox, suggested that the core could have been split along the centre line of each web, so that half the web would have been in each half core; if this had been done, the difficulty of drawing the bosses would have solved itself.

MR. HOLDSWORTH, in reply, said the drawing was not just as it should be, but the web was only two-thirds of the depth of the box placed midway between top and bottom of the casting.

Elimination of Wax

Asked whether he was perfectly satisfied that all the wax was eliminated from the core when the moulds were dried, MR. HOLDSWORTH said the fact that the casting was a good one was the answer. He admitted that at first he had been rather sceptical, and to make quite certain that the wax caused no trouble the core was given a very thorough drying. The green core was supported on a backing sand bed which was gradually removed to make sure that the underside was dry and firm enough to stand rolling over so that it could be dressed and blacked.

MR. TONGE suggested that a trial bar of wax might have been placed at some point of the mould in order to give an indication of absorption and afford some idea of the condition of the core. Mr. Holdsworth agreed that this experiment would have been interesting.

MR. PETERSEN said it would be interesting if Mr. Holdsworth would complete the picture by telling the meeting how the wax vanes were actually cast. Mr. Holdsworth replied that casting was very simple. The vanes were moulded horizontally in the usual way, jointed down and cast like an ordinary casting.

MR. TONGE pointed out that the behaviour of wax was supposed to be as near that of molten steel as it was possible to get, and experiments with molten steel were actually tried out by means of wax.

Matters of Technical Interest

MR. LION-CACHET recalled that some time ago he had referred to the difficulty of producing a steel casting in which spokes meet the rim of a gear wheel. A suggestion which had since been made to him by Mr. Bragg was that instead of having an oval spoke, causing cavities on the top of the junction, the more favourable design of an H section might be preferred. On smaller castings this method had proved most successful. On one occasion a very large wheel was made, and to make absolutely certain that the metal would be solid at the junction of the web and the rim, a core was inserted and the web left short. This method was supposed to be absolutely foolproof from the steel founder's point of view. This particular casting was a gear wheel with very deep teeth, and the casting proved so successful that it was almost impossible to see where the junction of the spokes and rim took place when the teeth were cut. After the wheel had been in commission for some time, however, the centre of a tooth at the top of every spoke fell off, suggesting inaccurate gear cutting—a typical example of an overloaded tooth. The extraordinary thing was that this only happened at the top of each spoke. After careful measurement no appreciable difference was found in the thickness of the tooth. No evidence of pitting or any other defect was visible in the teeth which fell off. Mr. Lion-Cachet asked whether any member could suggest a possible cause and a method by which the trouble could be eliminated? The wheel had been annealed with particular care.

MR. BULLOCK suggested that the boss might have heated up, causing expansion of the spokes and so pushing the teeth over each spoke deeper into mesh.

While MR. LION-CACHET did not see how the boss could have heated up, he admitted that it was quite possible for the rim to heat up and that thereafter the spokes might also have been heated. Against that argument was the fact that only one tooth fell out at the top of each spoke. He agreed that the suggestion was worth investigating.

MR. TONGE suggested that the trouble might be due to insufficient risers, and pointed out that there were still people who looked upon risers as an expensive luxury in a steel foundry. Yet it was better to allow 2 or 3 cwt. of metal for risers and obtain a good casting than to have to melt down a faulty casting.

Binder Costs

MR. WARD stated that he had been working out statistics relating to core mixtures, and had found out that 90 per cent. of the cost of a core mixture was in the binder. In making a fairly large blown core, 45 per cent. of the cost of the core produced was in the binder. He wondered if sufficient attention had been given to this point. The mixture they were using at present and from which these figures were taken was 32 parts of a clean white sand, 8 parts of a red sand, 1 part of dextrin, and 2 parts of linseed oil. This mixture gave quite good results, the cost actually working out at 0.3d. per lb. of core (material alone).

MR. LION-CACHET asked whether an attempt had been made to discover the extent to which a binder could be reduced without affecting the quality of the core.

MR. WARD said that the percentage given was as light as was possible without affecting the core.

Suggestion for Papers

MR. TONGE said that the Paper had served a useful purpose and had already brought along much useful criticism, four different ways of making this very intricate job having been suggested. He felt it was a compliment to the authors that their Paper should have aroused so much interesting discussion. He then informed the meeting of a suggestion which had been made to him that members should form themselves into several sections, according to their particular angle on foundry problems. Thus a patternmaker might present a Paper from his viewpoint which would interest moulders; a moulder one which would interest patternmakers, etc.

Industrial Co-operation

Complaints regarding lack of co-operation between managements and employees and interpretation of the Essential Work Order have been expressed by Mr. T. Meehan, of Middlesbrough, district officer of the Iron and Steel Trades Confederation. Mr. Meehan said the Order recognised the rights of the workers, but there were too many managements disinclined to talk things over with their employees. The good employers had meetings with representatives of the men on questions arising out of the Order and on production generally. These had resulted in greater output. On the other hand, there were employers who looked upon co-operation with employees as interference. In these cases there was not full effort, but irritation and dissatisfaction. Mr. Meehan pointed out that under the Order workmen could be dismissed for grave misconduct, but no penalties could be imposed on the employer. Mr. Meehan also complained regarding the indifferent attitude among both employers and employees.

Stainless Steel in Coal-Cleaning Equipment

One of the most serious economic problems encountered in the operation of the coal-cleaning plant at the Roslyn mines, Washington, installed in 1935, has been the highly corrosive and erosive effect of the wash water and the wet coal upon all metal surfaces with which they come in contact. This has necessitated very frequent renewals and repairs to equipment, states E. R. MCMILLAN, in "Mining Congress Journal."

Some improvement has been achieved by the substitution of stainless steels for other metals wherever possible, and through the use of rubber or other protective coatings on regular metal surfaces. The maximum life of fan blades made of either ordinary carbon or special carbon steel was about 90 days, whereas after attaching $\frac{1}{8}$-in. thick stainless steel plates on to the face of the blades and spider arms in March, 1939, no material wear was shown on these plates after 28 months, or some 1,500 shifts. In the case of dewatering screens and dryer decks, the life of the stainless steel is more than ten times that of carbon steel, and three to six times that of either hard brass or phosphor-bronze. Stainless steel shaft, impeller and rings in a recirculating pump have been in continuous service for two years, which is three to four times the life of the original brass equipment. This is a 12-in. discharge centrifugal pump handling about 4,000 galls. of re-wash water against a 55-ft. head.

Two rubber-lined "Hydroseal" pumps, with rubber impellers, for recirculation of wash water and slurry disposal, were installed in 1939, and have increased considerably the normal period of operation, without requiring overhaul or renewal, over that of the standard pumps with cast-iron casing and brass impellers formerly used. It may be noted that neither the recirculating water nor waste water in this plant is acidic. Both show a *p*H value of 8, which is slightly alkaline.

Recent American Developments in Cast Iron

(*Concluded from page* 376.)

to the Charpy test. A committee of which he was a member was pursuing the modified Izod test in this country. In reply to a question, he said the committee had not standardised that test, but was studying its possibilities.

MR. RUFFLE asked how the grooved bar was mounted.

DR. EVEREST replied that the centre line of the groove should be level with the top of the vice. However, one should not regard that test as standard, or adopt it, until more information had been published about it, because it might have to be abandoned for other methods.

MR. RUFFLE, referring to uniformity of product, pointed out that sustained mediocrity was better than occasional perfection.

The PRESIDENT expressed the hope that someone would suggest a word which could be substituted for "inoculation," for he did not think it was a suitable word to use for the process referred to.

Vote of Thanks

MR. CURRIE proposed a hearty vote of thanks to Dr. Everest for his most instructive address, which was a mental stimulant to all who had heard it; it would give rise to a great deal of thought on matters which one was apt to forget in the present rush for higher production.

MR. LOGAN, who seconded, said it was a privilege to listen to the address, and he expressed gratitude to Dr. Everest for having spared the time to prepare and deliver it.

DR. EVEREST responded to the vote of thanks which was heartily accorded.

Desulphurisation of Pig-Iron

ANALYSIS OF SOME PROBLEMS REVELANT TO FOUNDRY PRACTICE

Changes in the raw-material basis, and particularly the exploitation of new iron-ore resources, have directed increased attention to the economic desulphurisation of pig-iron, especially in Germany. Reviewing the development of technology in this direction in Report No. 191 of the blast-furnace committee of the Verein deutscher Eisenhüttenleute, published in "Stahl und Eisen," W. EICHHOLZ and G. BEHRENDT, of the metallurgical department of the August-Thyssen Hütte A.G., refer to the extensive research carried out by these works on the comparative efficiency of various desulphurising processes, a comparison which experience shows is much more difficult than might appear at first sight. Much care is required already in taking samples, for the sulphur is rarely uniformly distributed, and when tapping is usually found to drop off at the end of the run. Thus an initial sulphur value of 0.180 per cent. has been observed to drop to 0.090 per cent. at the end of the tap; in another case the extreme values were 0.168 and 0.046 per cent., *i.e.*, over a range of 4:1. Samples should therefore be taken at intervals throughout a tap and an average calculated from these.

This wide difference in the sulphur content throughout a tap suggests that desulphurisation might be effected in the blast furnace itself, by maintaining a sufficient amount of a reactive slag over the molten charge. The marked drop in sulphur content is due to the fact that if enough slag is present in the furnace, the droplets of iron become desulphurised in their passage through the slag, so that the thicker the slag cover the greater the degree of desulphurisation. For instance, W. Oelsen points out that sodium silicates can remove appreciable quantities of iron sulphides from molten charges. The authors recall that desulphurisation of pig-iron in the blast furnace through the medium of a furnace slag was actually patented in Germany in 1907.

TABLE I.—*Desulphurisation Tests in Furnaces 3 and 8.*

		Furnace 3.	Furnace 8.
Temperature, deg. C.		1,357	1,344
Amount of soda ash, kg. per ton pig iron		6.6	7.35
Amount of lime, kg. per ton pig iron		3.6	—
		Per cent.	Per cent.
Iron tapped	S	0.097	0.105
	Si	0.69	0.50
	Mn	0.65	0.95
Reduction in S	Relative	54	66
	Absolute	0.052	0.069
Reduction in Si	Relative	20.5	26
	Absolute	0.14	0.13
Reduction in Mn	Relative	9.3	7
	Absolute	0.96	0.065
Efficiency of soda ash		28.8	32.4

Trials have shown that the principle of this process is sound provided the slag can be maintained at a sufficiently high temperature. It may be noted that, of the physical and chemical changes which take place during desulphurisation, the physical ones are frequently the ones determining the efficiency of the process, for chemically powerful desulphurisers may have less action than those of lower chemical reactivity if the physical conditions of the slags formed are not conducive to an optimum reactivity. The effect of temperature is therefore frequently masked, and it becomes a very difficult matter, entailing extensive experiments under a variety of conditions, to determine the optimum conditions for desulphurisation.

Soda Ash and Soda-Lime Mixtures

Following laboratory experiments, observations were conducted by the authors on over 200 tappings with each of two blast furnaces (3 and 8), one operating with soda ash and the other with a mixture of soda ash and lime. The vast amount of data collected did not reveal any clear and simple connection between the degree of desulphurisation and the proportions of Si and Mn at the start of the process and their variation during tapping, or with the temperature of the iron. The effect of the initial sulphur value was, however, pronounced, for desulphurisation became the more effective the greater the sulphur value, using the same amount of soda ash. The increase was not exactly a direct proportion, as desulphurisation could not be taken beyond 50 to 60 per cent.; also the desulphurising action was better in furnace 8 than in furnace 3. There was also a greater reduction in silicon content when using soda ash alone, in spite of a low initial concentration, than when using a soda-lime mixture. The reduction in manganese was roughly the same in both cases. The degree of S and Mn reduction indicates that the S removed by soda ash was not wholly present as Mn sulphide. The results of these experiments are summarised in Table I.

In addition, comparative tests were made with two ladle-charges tapped at the same time from the same furnace. One 30-ton charge received 200 kg. soda ash and the other a series of mixtures of soda ash and lime, with soda-lime ratios of 90/90, 120/90, 120/120, 150/90 and 150/120 kg. Again, the higher initial sulphur showed a better soda-ash reaction, the reactivity increasing with sulphur content more rapidly when using the mixtures than with plain soda ash. High S values are usually associated with low iron temperatures, and owing to their greater quantity, the effect of the mixtures is limited as compared with soda ash alone. The general conclusion already drawn by Oelsen was confirmed, *viz.*, that the lower the final S value required in the pig-iron, the less must be the amount of S removed per unit mass of the desulphurising agent.

The final S value is just as important as the initial S content, sulphur elimination being after all the object of the process. The relationship between final and initial S values when using different mixtures can be indicated graphically, the plot serving to give the most suitable mixtures for any particular terminal S values. Discussing this question, the authors deduce the marked superiority in certain cases of a 4:3 soda ash/lime mixture over a 5:3 mixture and plain soda ash, this result applying only to reaction in the blast furnace and as confirmed by experiments at three ironworks.

Desulphurising with the Double Na-Ca Carbonate

Oelsen has called attention to the formation of a double carbonate on fusing together soda ash and $CaCO_3$ (limestone); this carbonate melts at 813 deg. or some 50 deg. lower than soda ash. It would appear that this salt should exercise a powerful desulphurising action, especially in the fluid state. In experimental work in conjunction with the Kaiser-Wilhelm-Institut für Eisenforschung, the double salt was molten and then added to the iron, when it caused violent reaction. Against expectation, desulphurisation was found to be less efficient than with plain soda ash; the same result was obtained with the sintered carbonate. The reason for this failure is that the highly fluid salt after reaction forms a very viscous slag, which may solidify and then become totally ineffective. Experiments were also conducted to find a difference, if any, between the action of solid and molten soda ash; with an initial sulphur of 0.10 to 0.13 per cent., sulphur elimination was between 10 and 15 g. of S per kg. of solid soda ash better than with the molten reagent.

Desulphurising after the Mixer

Various advantages accrue if desulphurisation is affected after the mixer, for: (1) The pig-iron poured from the mixer contains no furnace slag and none of the silica which in a fine state of division is mixed with the iron; (2) temperatures are more uniform than in the furnace; (3) initial sulphur being more uniform the amount of soda ash to be added can be more accurately determined; (4) a constant-weight charge can be used in the ladle and hence the amount of soda ash added can be standardised; (5) the final S value can be adjusted as required for subsequent operations; (6) the use of molten soda ash is simplified; (7) a lower-lime and richer-alkali slag is obtained; (8) there is better protection against soda-ash dust; and (9) the durability of the mixer is increased as no soda slag residues reach the mixer. The disadvantages are the lower temperature of the pig-iron and hence lower reactivity of the desulphurising agent, and also a probable reduction in converter life and in desulphurising efficiency in the converter, owing to the presence of the soda slag.

Experiments show that good results can only be achieved if the throughput of the mixer is maintained fast enough to keep the pig-iron hot. In the main experiment 3,500 tons of non-desulphurised iron was passed through the mixer and the temperature kept at the right level. In the first trials the amount of soda ash used was intentionally taken very high; later it was reduced. Normal desulphurisation was obtained up to the 60th experiment, after which a reduction in the furnace temperature caused the sulphur to reach a maximum of 0.160 per cent., which naturally reacted adversely on the Mn reduction. Desulphurisation to below 0.040 per cent. was achieved in exceptional cases only, irrespective of the amount of soda ash added. Tests showed that even small quantities of soda ash are sufficient to desulphurise down to normal levels, *viz.*, 0.105 to 0.120 per cent. S with about 3.2 kg. soda ash per ton.

TABLE II.—*Desulphurising Control Figures.*

Initial sulphur.	Soda ash added to pig-iron.	Final sulphur.
Per cent.	Per cent.	Per cent.
0.060 to 0.080. Average 0.0685	0.323	0.036
	0.386	0.040
	0.532	0.035
0.080 to 0.100. Average 0.090	0.386	0.041
	0.532	0.045
	0.645	0.0427
0.100 to 0.120. Average 0.106	0.323	0.061
	0.386	0.041
	0.532	0.051
	0.645	0.042
0.120 to remainder. Average 0.138	0.386	0.0556
	0.532	0.058
	0.645	0.062

Further tests with soda ash/lime mixtures gave negative results, and even if the quantity of soda ash in the mixture was the same as with soda ash alone, the desulphurising action was reduced by the presence of lime. The greater heat absorbed by the mixture adversely affects the temperatures after the mixer, and the slag becomes very viscous and inert. The soda ash required for desulphurisation behind the mixer is roughly half that needed for a similar result in the furnace; also it is not always possible

Desulphurisation of Pig-Iron

to reduce below a certain final S value by continually increasing the amount of soda ash added. The best practice is therefore to use just as much soda ash as will be sufficient to reduce the S to the required final value, taking as a guide the data given in Table II.

A point to be noted is that the soda slag must not pass into the converter when the charge is poured from the ladle; the authors recommend the use of a slag catcher of the type adopted at Corby, which also permits part of the slag to be used again, thus reducing soda-ash consumption. The use of these slags is an important problem, and depends on their content of lime and alkalis.

Desulphurising with Lime in Rotary Furnaces

The production of low-S pig-iron from high-S purple ores led to tests being made of the feasibility of desulphurising pig-iron in rotary furnaces using lime alone. A large scale test conducted by the Mannesmannröhren Werke resulted in the desulphurisation of 56 tons of pig-iron from 0.186 to 0.035 per cent. S in 117 min.; this opened up new possibilities and led to further work at Hamborn on rotary furnaces heated with coke-oven gas. Desulphurisation was found to take place very rapidly in an iron with about 1 per cent. S and 1.5 to 2.5 per cent. Si, the reduction being from 0.94 to 0.53 per cent. in 40 min.; after this there is an abrupt and continuous retardation in the rate of reaction. The original trials at Stürzelberg seemed to indicate that satisfactory reducing conditions could not be obtained in a furnace heated with coke-oven gas, and that desulphurisation would hence be inadequate. This was confirmed in the Hamborn experiments, and led to tar oil being added to create suitable reducing conditions. Neither this nor other changes in the fuel gave better results, and reasonable desulphurisation was only obtained by the repeated addition of fresh lime. The furnace was next modified to burn pulverised fuel, and the requisite reducing atmosphere was then readily obtained. Desulphurisation was very rapid during the first 20 min. while the pig-iron comes in contact with the fresh lime; in one experiment where 800 kg. lime and 200 kg. fine coke were added to a 5-ton charge the sulphur was reduced from 0.210 to 0.032 per cent. in one hour.

These and other experiments indicate that desulphurisation with lime in a rotary furnace is a practicable proposition, giving desulphurisation rates of 0.35 per cent. S per hr. with a 6 to 10 per cent. lime consumption, and the addition of 2 to 3 per cent. carbon for reduction. It is noted that the reaction does not take place at a uniform rate; it may take some time to become initiated, or may start at a high speed and rapidly decay to a slow rate. Desulphurisation can be taken to extremely low values in the rotary furnace, but this requires a long time. An unexplained feature of this process is the very large amount of iron which is lost; at Hamborn the iron yield was only up to 90 per cent. in the experimental plant. It is believed that these losses can be reduced by cutting down the quantity of lime added.

Desulphurising with a Lime Blast

Oelsen has also described the results of laboratory desulphurising tests using finely ground lime, in which the sulphur was reduced to very low values employing temperatures of 1,300 to 1,400 deg. This led to further tests with an acid-lined ladle which was reconstructed to allow powdered lime to be blown through the charge. The lime was ground fine and the air for blowing kept to a minimum. Coal dust could also be added to the lime to give an excess of reducing agent against the oxygen in the blast. On adding 3.5 per cent. lime, the sulphur was reduced from 0.120 to 0.065 per cent. in 0.75 min., the silicon being reduced from 0.47 to 0.40 per cent. The manganese content remained unchanged. In another experiment an acid iron had the sulphur reduced from 0.320 to 0.069 per cent. in three stages at intervals 1.9 min.; the silicon came down from 1.69 to 1.44 per cent., and the Mn from 0.74 to 0.32 per cent.

No law could be deduced from these first tests. The temperature drop was considerable owing to transferring to the cold ladle, and the Mn loss hence high. The temperature drop may perhaps be reduced by controlling the volume of the air blast. It is nevertheless clear that satisfactory results can be obtained with this process.

Desulphurising with Manganese

If conditions are suitable, desulphurisation with manganese with the formation of the sulphide can be extremely efficient; thus in one experiment the manganese was reduced in 2 hrs. from 0.49 to 0.29 per cent., while the sulphur was lowered from 0.17 to 0.09 per cent. A high degree of desulphurisation which it was thought could only be obtained with soda ash can thus also be obtained with comparatively low Mn values. In another case the Mn was reduced in 6 hrs. from 0.27 to 0.07 per cent., and the sulphur from 0.49 to 0.36 per cent. The Mn and the S are hence reduced in roughly the same ratio as the amount of sulphide formed.

TABLE III.—*Results of Manganese Reduction.*

Test no.		1	2	3	4
Charge in kg.	Ore	650 Geier	650 Geier	200 Poti	650 Geier
	Coke	200	200	—	—
	Lime	200	400	130	300
Initial values Per cent.	Si	1.73	1.22	2.22	2.16
	Mn	0.24	0.07	0.27	0.32
	S	0.380	0.650	0.120	0.340
Reduction per cent. per hr.	Si	1.20	1.04	1.00	1.45
	S	0.205	0.415	0.045	0.152
Increase in Mn, per cent. per hr.		0.52	0.34	0.83	0.43
Yield, per cent. Mn		30.5	15.4	53.0	26.5
Loss of sulphur per cent.	Absolute	0.240	0.380	0.058	0.190
	Relative	63	59	48	56

In co-operation with the Kaiser-Wilhelm-Institut für Eisenforschung, Oelsen suggested utilising the reducing power of Si to liberate Mn from its oxides in the ore and to carry it over to the pig-iron. The sulphur occurring as iron sulphide in the pig-iron is then transformed into Mn sulphide and separates out. This was tested in the pulverised-fuel-heated rotary furnace referred to above, (1) by preliminary reduction of the ore with carbon, whose chief purpose is to remove the iron from low-Mn ores, the rest of the manganese being reduced later by the silicon in the pig-iron, and (2) by reducing the ores with silicon alone. The ores used were a Geier ore with 28 per cent. Fe, 16 per cent. Mn, less than 1 per cent. CaO and 22 per cent. $SiO_2 + Al_2O_3$, and a Poti ore with under 1 per cent. Fe, 52 per cent. Mn and 9 per cent. SiO_2. A special advantage of this process is that with an acid-Bessemer charge no manganese need be added to the charge, thus excluding a resulting low yield of Mn. The results of these tests are given in Table III, and show that in experiments 1 and 2 Mn reduction was not satisfactory, while the reduction in sulphur was just tolerable. In experiment 3 with Poti ore without preliminary reduction, the Mn reduction was exceptionally good, just as in experiment 4 with Geier ore. The rates of desulphurisation, especially in test 3, with low initial sulphur, were quite small. Against expectation, the reactions took place at a comparatively slow speed. Observations were in the main discontinued after one hour, this period being regarded as the economic limit. The process appears to be quite practicable with high-S and siliceous pig-iron, a rate of desulphurisation of 0.4 per cent. S per hr. being obtained in some cases. The basicity of the slags does not appear to have a serious influence, as even when the basicity fluctuated between wide limits the reaction was barely affected.

DISCUSSION

In the course of the discussion on the Paper, H. REINFELD said that three years' experience at Völkingen with the soda-ash process showed that adding molten soda to pig-iron gave a 7 per cent. improvement in desulphurisation. More sulphur can be eliminated by using an arrangement which recirculates the pig-iron through the bath to react with unused alkali. Analyses showed that soda slags contained 8 to 15 per cent. water-soluble alkalis. Molten soda ash was being used at Völkingen to reduce as far as possible the temperature drop. Conditions did not permit desulphurisation before charging into the mixer as described, and it has to be done directly after the blast furnace. Care must be taken to avoid sand from interfering with the action of the soda ash. The blast-furnace slag must also be prevented from running into the ladle. Moreover, experiments with mixtures of soda ash and lime did not give the same good results as soda ash alone. Particularly unsatisfactory results were obtained when the mixtures were melted in the soda melting plant; injury to the ladle lining was very marked and troublesome. Much of the lime is also lost, in spite of careful heating, and on adding to the mixture soon after leaving the blast furnace forms a thick crust which it is difficult to break through. The experiments were eventually abandoned as results were unsatisfactory.

A. WILHELMI, of Oberhausen, also reported that good results had been achieved with soda ash. As an experiment they used a soda tower similar to the so-called Röchling "coffee pot," working with a long column of molten soda ash. The soda is added to the ladle in a granular state and becomes liquefied. On passing the pig-iron through the column of soda, extensive desulphurisation takes place. The advantage of the tower is that the soda ash is used twice, once on direct addition to the ladle and a second time on pouring the pig-iron through the column. The same degree of desulphurisation as in the ladle is thus obtained with a smaller amount of soda ash. Reduction in S was from 0.360 to 0.042 per cent. after the tower with a soda consumption of 2.3 per cent., the charge being 8,832 kg. molten Bessemer pig. In the ladle, sulphur was cut down from 0.360 per cent. to 0.053 per cent. in front of the mixer, with a soda consumption of 4.1 per cent. on a charge of 5,181 kg. of similar iron. The results were satisfactory, but the tower was not very durable.

A. KRUS reported that at Stüzelberg a higher rate of desulphurisation was obtained than stated in the Paper, *viz.*, 0.9 per cent. S per hr. Low rates of desulphurisation in small furnaces may be due to the unfavourable ratio of length to diameter. He considered desulphurisation in a rotary furnace using lime to be especially advantageous; the slag, being a pure lime-silica mixture, can be used directly for other purposes.

Improving Chromium Yield

From the results of 108 test analyses in the production of ferro-chrome, CHITRIK and GLIKSSON, in "Teori. prakt. met.," conclude that the Cr yield from chrome ore can be raised from 55 and 65 per cent. to 85 per cent. by increasing the basicity of the slag ($CaO/SiO_2 = 1.5$ to 1.6) and by reducing the slag inclusions by suitable overheating.

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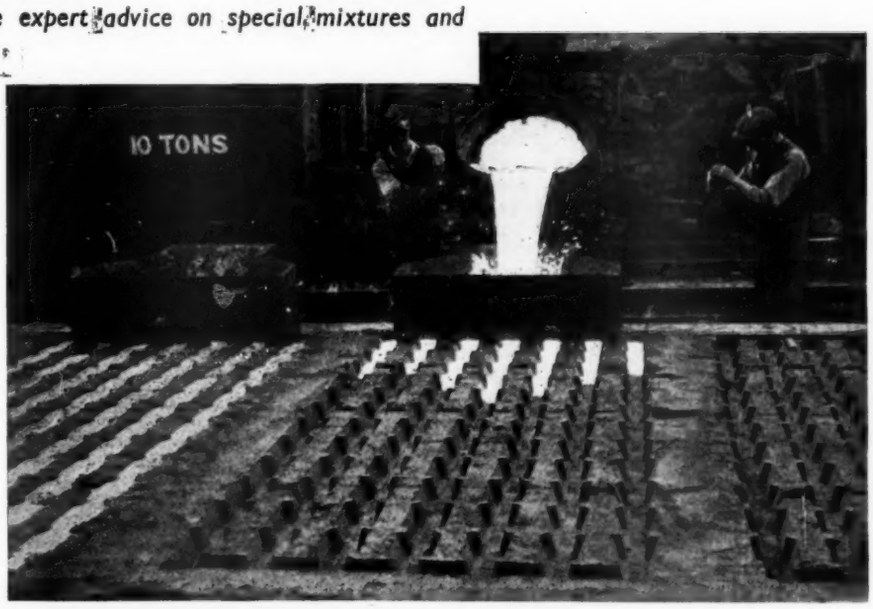

THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

The American Metallurgical Scene—5

Copper-Base Castings*

By JOHN W. BOLTON, Chief Metallurgist, the Lunkenheimer Company, Cincinnati

In the casting field, "Faster Production for Defence" begins with getting good, sound, uniform castings. This is equally true whether the castings be copper-base alloys, specifically bronzes, as discussed in this article, or brasses or steel, or cast iron or light metal alloys.

Low foundry losses and minimum machine-shop rejection and troubles, coupled with structures suitable for rapid machining and for the services to be encountered are mandatory if really fast production is to be attained. Castings troubles represent losses in melting room, in moulding, in fettling, in machining, and in inspection. Actual loss in efficiency is several times the percentage loss of castings. There are lost not only man-hours, but also materials, machine capacity, and the like—and a heavy drain on the supervising staff occurs. Bad castings in the machine shop often mean not only man-hour losses, but also often make it impossible to set suitable high machining rates—in production work the rate must be set on the least favourable portion, not on the average or on the optimum cutting portions. Uniformity is very essential.

It is not a purpose of this article to discuss materials handling, sand conditioning, moulding methods, or machine-shop practice. It is preferred to start with the melting process, the foundation or starting point.

Importance of Furnace Atmospheres

Furnace atmospheres are highly important. Years ago there was a great deal of talk about the evils of "oxidising" atmospheres. Researches within the last 15 years have shown conclusively that "oxidising" atmospheres are not often responsible for defective bronze castings; in fact, slightly oxidising conditions may be desirable for some purposes.

As has been shown by the writer and others, the usual cause of intercrystalline porosity is what may be termed incipient shrinkage, and it has been shown that presence of excess reducing gases, particularly carbon monoxide and hydrogen, in the furnace atmospheres are potent factors in aggravating and promoting spongy, unsound castings. Out of the welter of contradictory opinions and inconclusive experiments it is definitely clear that carbon monoxide (in absence of hydrogen) can promote unsoundness in bronzes and that hydrogen definitely is dangerous in making copper castings. It is probable that hydrogen may be an offender in bronzes also.

A first step in speed and efficiency is definite and accurate control of furnace atmospheres. One gas analysis is worth a thousand melters' opinions. By regular use of an Orsat apparatus and suitable (preferably constant automatic) burner regulation positive control can be effected in fuel-burning furnaces. In electric furnaces atmospheric control also can be definitely effected. Excesses of reducing gases can be avoided or eliminated. For most purposes on ordinary bronzes a maximum of carbon dioxide and a slight excess of oxygen is desirable. In fuel-fired furnaces such atmospheres offer added advantages in most rapid melting and maximum fuel economy. In view of the obvious advantages in better castings, low losses, speed, and fuel economy it is surprising that many foundries shy at the simple technical control and regulation needed.

* One of a series of short articles appearing in "Metals and Alloys," covering the general subject of speeding up munitions production.

Temperature Control

A great deal has been written about temperature control, particularly control of pouring temperatures. With proper furnace atmosphere control, ranges of permissible pouring temperatures are considerably widened. Pouring temperatures depend on the size and design of castings and on the ability of the sand to withstand the action of the metal. In general, higher temperatures promote better feeding, lower temperatures help to avoid sand troubles and mask to a degree improper furnace conditions. Actual melting process temperature, in the furnace before pouring, is in many ways as significant as pouring temperatures. Overheating is detrimental, and regular pyrometric control of furnace-melting temperatures desirable.

Gating and riser practices should be generous. A high yield (on melt) is false economy if unsound castings are a result. Pouring hot metal on to charcoal is bad practice and much metal has been gassed from this cause.

Beside general porosity, incipient shrinkage, fine pinholes may at times be found, especially on machined surfaces. Some may be readily visible, usually round in cross-section; some may be very fine, barely visible under a 5X magnifying glass. This trouble often is due to low permeability in moulding sand, and related causes. Some alloys are more susceptible to it than others. There are many types of defects other than the two mentioned, but in general foundrymen and metallurgists understand their symptoms and control rather well.

Special Alloys

Certain of the special alloys, silicon bronzes and brasses, for example, require distinctly different practices than are required for the tin, tin-zinc, and tin-zinc-lead bronzes. For the tin and related bronzes, phosphorus added to residual amounts of under about 0.02 per cent. is an efficient deoxidiser and cleanser. The other copper-base alloys often require special additions and careful research and some experience is needed to handle them to best advantage. With properly worked out and standardised practices they can be made with very little foundry trouble.

In the alloys containing tin, presence of the alpha-delta eutectoid is a definite deterrent to maximum machinability. The presence of phosphorus in considerable amounts increases the amount of microscopic hard spots, as does iron when this gets high. The addition of lead to these alloys very markedly promotes machinability. Up to about 1.5 to 2.0 per cent. the increase in machinability is very marked, beyond that range the increment hardly increases in proportion to the percentage. For pressure work some of these alloys are permitted at temperatures of 285 deg. C., and below that for most of them. Careful studies have shown that there is no appreciable difference in creep strength or loss of ductility (embrittlement). Specifications not permitting lead are thus unduly restrictive, and such specifications slow down machining very materially.

Concluding, the starting point for faster production of bronze castings for defence lies in foundry practice, low foundry and machine-shop losses, good and uniform castings. To attain these ends regular technical control is essential, and especially so as preventive medicine. Methods of gas analysis, pyrometry, sand testing and the like are needed in addition to chemical analyses, physical tests and some microscopy. Low losses, serviceable product, ready machinability, these are sound foundations. Control of furnace atmospheres by actual gas analyses is urged as a desirable specific practice too infrequently employed.

Magnesite-Trust Trial

The trial of four American corporations and seven individuals, accused under the anti-trust Acts of causing a shortage in firebrick, recently heard in New York, resulted in the group being fined a total of $76,500. The companies pleaded *nolo contendre*, thus refusing to contest the charges. The firms concerned were Harbison-Walker Refractories Company, Philadelphia; General Refractories Company, Philadelphia; American-Austrian Magnesite Corporation, Pittsburgh; and Austrian Magnesite Company, Limited, of Germany, a wholly-owned American-Austrian Magnesite subsidiary. The indictment had charged that the trust had divided up the world trade in magnesite, giving each firm certain territories in which there was no competition. The effect of the agreement, it was alleged, had been to cause a "shortage of magnesite and magnesite brick in the United States." The Assistant Attorney-General declared the agreement had not only prevented the free flow of magnesite, but, with purchase by two companies of the Northwest Magnesite Company, not named in the indictment, had included control of 85 per cent. of the United States production of magnesite.

Iron Ore from New York State

Growing demands of American armour-plate makers for more high-grade iron have prompted the M. A. Hanna Company, Cleveland mining concern, to reopen the historic, 75-year-old Clifton ore fields of St. Lawrence County, New York, deposits unworked since 1870. Other large steel companies are also reported considering development of New York State iron-ore deposits. Clifton's annual tonnage is expected to average over 300,000 tons of lump and "sinter" ore. The ore, a rich magnetite, is regarded by experts as having perhaps the lowest phosphorus content in the country. The early development of the Clifton fields proved disastrous because the ore could not be smelted at the mines by the primitive equipment available.

Coke Production

The production of both by-product and beehive coke in the United States for the month of June amounted to 5,400,135 net tons, states the Bureau of Mines; this was an increase of 4.2 per cent. over the rate of output in the preceding month. Compared with the daily coke output in June, 1940, there was an increase of 20.4 per cent. Of the total production, 4,836,035 tons was made in by-product ovens, and 564,100 tons in beehive ovens. The output of by-product coke in the first half of the year was 28,591,000 net tons, against 25,525,000 tons in the parallel period of last year. The corresponding figures for beehive coke are 2,794,000 and 940,300 tons respectively.

Prices v. Wages in Steel Industry

From the pre-war level of July, 1939, to mid-July, 1941, U.S. steel prices have increased an average of only 1 per cent., according to the American Iron and Steel Institute. This compares with an average rise of almost 17 per cent. in the U.S. Department of Labour's index of wholesale commodity prices during the same period, and an increase of 15½ per cent. in hourly earnings of steel workers. According to the Institute, the composite price of finished steel products has remained unchanged at 2.26 cents per lb. for the past 20 months. It compares with 2.24 cents per lb. in July, 1939, with 2.51 cents in 1937, and with 2.70 cents in 1923.

AMERICAN DELIVERIES of machine tools in August amounted to $64,300,000, which is a record for any month and 58 per cent. more than in August, 1940.

PRODUCTION OF COMMERCIAL STEEL CASTINGS in the United States during the first eight months of this year amounted to 944,632 tons against 537,007 tons in the like 1940 period. Bookings during the January-September period were 1,246,780 tons or almost three times the tonnage booked in the similar 1940 period.

THE NATION WIDE aluminium collection campaign in the United States yielded about 5,917 tons of scrap, equivalent to the aluminium needed in 1,900 fighter planes or 350 four-motored bombers. All this scrap is going to the smelters, for which they will pay 9.00 cents per lb., an expected reduction of 2.00 cents per lb. in the ceiling prices for scrap. The resulting refined material will be sold to Metals Reserve Company on the basis of 14.00, 14.50 and 15.00 cents per lb. for the respective remelt grades, these prices also being 2.00 cents. per lb. below current ceiling levels.

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Steel Corporation of Bengal

COMPLETION OF WORKS

The directors of the Steel Corporation of Bengal, Limited, in their report for 1940, record encouraging results from the new plant. The final construction stages of the Corporation's works, as originally planned, were completed during the year. The first furnace commenced operation in November, 1939. The second furnace was tapped in the early part of 1940 and the third a little later. With a mixer operating satisfactorily, the working conditions of the furnaces have improved considerably. The preliminary difficulties experienced with the dolomite plant and the use of gases were gradually lessened, but it became necessary to extend the producer gas plant. There were no serious operational dislocations of work. During the year there were no off-casts made, and all the steel made was rolled into saleable products. As the year progressed, improved conditions were reflected in lower refractory costs and lower coal and dolomite consumptions.

The 40-in. mill worked on one shift until the beginning of March, 1940, when with increased ingot production a second shift was brought in. The mill has been working satisfactorily. With the 34-in. mill, also, despite the initial starting troubles, operation has been satisfactory and mechanical and electrical delays very few. The 18-in. mill, soon after the year commenced, was engaged on two-shift working.

As the conditions created by the war emphasised the need for a larger output of heavier sections, the Government of India expressly requested the Corporation to carry out an extension of the finishing bays of the rolling mills which it had planned to execute three or four years hence. The Corporation was also requested to arrange for the production of special qualities of steel required by the ordnance factories. The Corporation commenced work on these extensions, which it was expected would be completed during 1941. At the commencement of the year, the sheet mills were less forward in construction in comparison with the rest of the plant. Black sheets were rolled in the first month of the year, and the annealing furnaces were started immediately afterwards. With these operations satisfactorily launched, the galvanising units were started and the manufacture of corrugated sheets undertaken. The roughing and finishing mills by the close of the year were in a position to operate to full capacity.

Accounts for 1940

Up to January 1, 1947, the holders of the Corporation's £1,000,000 4½ per cent. mortgage debentures possess the right to convert their debentures into fully-paid ordinary shares at the rate of 40 ordinary shares for each £50 debenture. During 1940 debentures of the face value of £377,950 were so converted into 302,360 ordinary shares of Rs. 10 each. Due to this conversion, the issued and subscribed share capital of the Corporation is increased from Rs. 3,69,91,600 to Rs. 4,00,16,325, while the debenture liability has decreased from Rs. 1,33,33,333 to Rs. 82,94,000.

For the year under review, the gross profits amounted to Rs. 29,56,245. During the year interest was paid out of capital at the rate of 4 per cent. per annum on the Corporation's preference shares up to May 31, 1940. Subsequent to this date payment of interest is chargeable to revenue, and the directors accorded sanction for payment of interest at the rate of 5 per cent. per annum on the preference capital for the half-year ended November 30, 1940. After making provision for debenture and preference interest, depreciation and other appropriations, and all charges for the year, there was available a sum of Rs. 3,77,656, which the directors carried forward.

Comparative Durability of Rolls

L. F. GELJUCH, in "Teori. prakt. met.," gives the results of a comparison under working conditions of the rolling of mine rails, of ordinary cast-iron rolls and low-alloy semi-hard chill-iron rolls. The wear on the former was 5.1 kg. per ton of material rolled and on the latter 6.3 kg. The chill-iron rolls are, however, better for rolling zeds and tees owing to their finer grain and more uniform structure.

New Principle in Metal Cleaning?

A new product, "Kolene Kleaner," using a new approach to metal cleaning, has met with considerable success in removing greases, oils, paints, mill and heat-treat scale, and silica scale, by oxidising all of these materials on the surface of the metal, the oxidation converting them into readily removable compounds, states W. F. SHERMAN, Detroit Editor of "The Iron Age." The cleaner is a bath of catalysed molten salts. Its first action is that of degreasing, by oxidation of all carbonaceous matter, oils, greases, etc. The second action, simultaneous with the first, is the conversion of materials on the surface, including mill scale and heat-treat scale, which are relatively insoluble in many cleaners, into very readily soluble materials which can be removed in a mild acid bath. This action is accomplished through application of the well-known fact that the oxide of any metal containing the most oxygen is more soluble than oxides containing less oxygen.

Another aspect in the use of this new cleaner is presented in the cleaning of cast-iron surfaces which normally have on them so much silica that plating or coatings of any sort are extremely difficult to apply. In this case the reaction with the cleaning material is to convert the silica to silicon dioxide, which is soluble in the cleaner. The present general practice of acid pickling exposes other materials such as phosphorus, sulphur, carbon and silicon because of the severe action of the acid on the metal itself. Where these are present, the Kolene Kleaner is said to oxidise the P, S and C into vaporisable oxides.

The Kolene mixture of salts is operative between 550 deg. and 600 deg. F., at which temperatures the salts form a clear green liquid. The carbonaceous materials oxidised by this liquid in the degreasing stage are all converted into vaporisable oxides which pass off as carbon dioxide without contaminating the bath. Hydrogen freed during some of the reaction escapes. The degreasing action is complete as evidenced by the absence of water break on the cleaned metal. The new cleaning method makes long pickling unnecessary, so it does not produce pickling smudge.

Another feature is the absence of hydrogen embrittlement on springs and similar parts which acid pickling sometimes produces, due to the release of hydrogen during the pickling action. The absence of hydrogen embrittlement after use of this cleaner is attributed to the short time required in the acid vat. Lock washers are among the parts which are being cleaned with this method, and tests of 100 hrs. in salt spray and on compression testing machines have been realised without failure of the metal.

Slovak Steelworks

An agreement between the German government-owned A.G. für Waffen und Maschinenbau Hermann Goering and the Slovak Government, signed March 29 and ratified by the Slovak Parliament on June 26, 1941, merged the Podbrezova Iron and Steel Works, Podbrezova, Slovakia, with the Hermann Goering works, states U.S. "Mineral Trade Notes." Operations will be under German management, and financial control will be in the form of a partnership with the Slovak Government. The Podbrezova Mining & Foundry Company, founded in 1938 with 150,000,000 Cz. cr. capital, has plants in Podbrezova, Piezok, Chvatimech, Hronec, Tisovec, and Banska Bystrica, including blast furnaces, basic and open-hearth steelworks, rolling mills, sheet mills, a tube mill, and a bridge-building yard. Production of the company includes cast steel and cast iron, steel castings, rolled products, tubes, plates, and sheets, enamelware, steel cylinders, mine rails, and electrolytic copper. The company owns iron mines in Zeleznik. Under the Czechoslovak regime the company employed about 3,200 workers. It is claimed that a large part of the equipment is obsolete and that in view of the change in the raw-material basis caused by territorial changes, both the technical and economic condition of the company have become critical. The Slovak State and the Hermann Goering works have arranged for a thorough modernisation and reorganisation of the works and for their affiliation with the Hermann Goering combine.

Reports and Dividends

Shotts Iron Company—Dividend of 5% (same).

Bradley & Foster—Interim dividend of 4% (same).

Aveling-Barford—Interim dividend of 5%, tax free (same).

W. G. Allen & Sons (Tipton)—Interim dividend of 2½% (same).

W. & T. Avery—Interim dividend of 5% on the ordinary shares.

Climax Rock Drill & Engineering—Interim dividend of 5% (2½%).

Hale & Hale (Tipton)—Dividend of 7½% (7½% for previous 13 months).

Allied Ironfounders—Interim dividend on the ordinary shares of 2½%.

Light Production Company—Interim dividend on the ordinary shares of 10% (5%).

Marshall, Sons & Company (Successors)—Final dividend of 10%, making 13¾% (same).

John I. Thornycroft & Company—Final dividend of 8% on the ordinary shares, making 13% (10%).

Drake & Gorham—Net profit to June 30, £10,237 (£1,961); dividend of 5%, £6,250; forward, £6,761 (£2,774).

Richard Thomas & Company—Dividend of 3½% in respect of the half-year to September 30 on the 6½% preference shares.

Whitehead Iron & Steel—Interim dividend on the ordinary stock of 10% (same) on account of the year ending March 31 next.

Moss Gear Company—Final dividend on the ordinary shares of 12½%, plus a 5% bonus, making 25% (22½%) for the year to August 31.

Heenan & Froude—Net profit for the year to August 31, £58,740 (£50,405); final dividend of 5% and a bonus of 5%, making 15% (same).

J. Brockhouse & Company—Net profit to September 30, £379,524 (£334,199); final ordinary dividend of 12½%, making 20% (same); forward, £134,120 (£127,764).

John I. Thornycroft & Company—Net profit for the year to July 31, £124,151 (£141,976); ordinary dividend of 13% (10%); to reserve, £50,000; forward, £68,350 (£67,653).

British Electric Transformer Company—Profit for the year ended September 30, £18,387 (£52,532); ordinary dividend of 7½%, less tax (40%, tax free); forward, £6,463 (£5,107).

Birmid Industries—Profit to October 31, £119,620 (£133,884); dividend of 10% (same), plus a bonus of 7½% (same); to reserve, £50,000 (£40,000); forward, £56,196 (£46,513).

British Piston Ring—Profit for year to July 31, after taxation, £49,194 (£48,811); final ordinary dividend of 15%, making 20% (same); to general reserve, £15,000 (same); forward, £32,752 (£32,557).

Crabtree Electrical Industries—Revenue for the year to October 31, £65,003 (£75,119); final dividend on the ordinary shares of 5% and a cash bonus of 7½%, making 17½% (same); forward, £19,618 (£19,665).

Henry Berry & Company—Net profit for the twelve months ended August 31, £5,189 (£9,157); preference dividend, £1,935; dividend of 12½% on the ordinary shares, £3,125; forward, £8,719 (£8,590).

Redpath Brown & Company—The report and accounts for the year to July 31, 1941, last will not be completed before the end of the calendar year, as certain matters must first be settled with Government departments.

Crompton Parkinson—Profit for the year ended September 30, £391,404 (£400,514); final dividend on the ordinary and "A" ordinary stock of 7½%, making 15% (same) and a cash bonus of 5% (same); forward, £284,218 (£187,360).

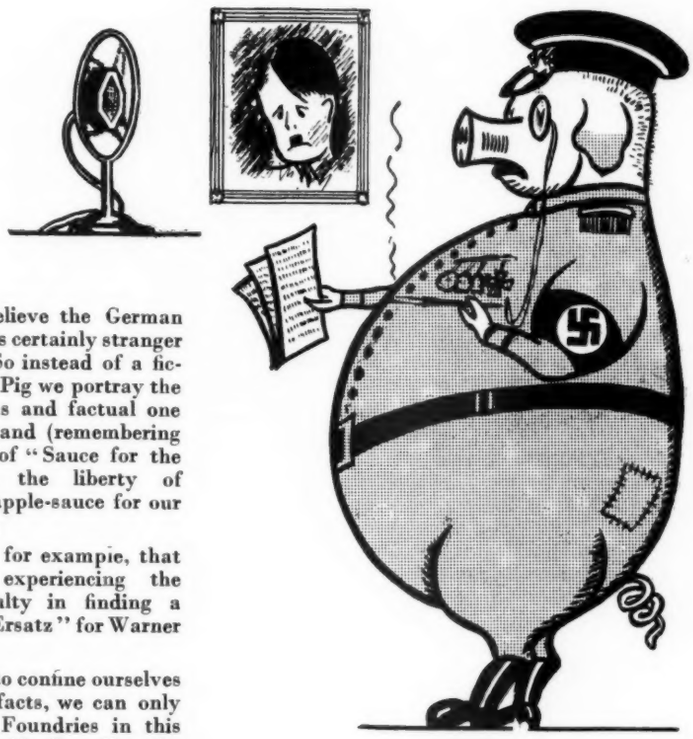
Brown, Bayley's Steel Works—Profit for the year to July 31, £92,216 (£135,991); dividend on the cumulative preference shares, £25,000; dividend of 13% (15%), free of tax, on the ordinary shares, £39,000; to general reserve, £20,000; to reserve for obsolescence, £10,000; forward, £40,932 (£42,716).

Samuel Osborn & Company—Profit for the year ended July 31, after depreciation, income-tax, war damage contributions, and E.P.T., £56,858 (£73,192); reserve for war contingencies, £25,000; dividends on the preference shares, £7,183; final dividend of 12½% on the ordinary shares, making 15% (same); forward, £126,561 (£123,953).

Dorman Long—The directors state that it will not be possible to present the report and accounts to September 30 before the end of the year, as certain important matters must first be settled with Government Departments. A formal meeting will be held at Middlesbrough on November 27.

W

"Jairmany Calling ...."



If we are to believe the German wireless, truth is certainly stranger than fiction. So instead of a fictitious Warner Pig we portray the *really* humorous and factual one from Bremen, and (remembering the old adage of "Sauce for the Goose") take the liberty of borrowing his apple-sauce for our impropaganda.

We might say, for exampie, that Germany is experiencing the greatest difficulty in finding a satisfactory "Ersatz" for Warner Pig Iron.

But, if we are to confine ourselves to established facts, we can only tell you that Foundries in this country are specifically calling for Warner Pig Iron, and that, knowing the destination of many of their products, we are supplying it to our usual standard, but with more than our usual satisfaction.

For

Warner's

Special Pig Irons

WARNER AND CO. LTD., CARGO FLEET, MIDDLESBROUGH

W

The Week's News in Brief

Trade Talk

THE ADDRESS of the Internal Combustion Engine War Export Group is now 32, Victoria Street, London, S.W.1.

THE TEES CONSERVANCY COMMISSION has appointed a sub-committee to prepare a report on local development after the war.

THE WAGES POSITION in the brassfoundry industry was reviewed at a meeting of workmen in Birmingham last Sunday week. It was decided to make an application to the employers for an increased bonus.

SHAPED-TOOL MANUFACTURERS have formed an association of which Mr. A. H. R. Shaw, of A. Shaw & Son, diamond tool manufacturers, Waterloo Road, Cricklewood, London, N.W.2, is chairman.

THE TEMPORARY OFFICES of the Ironfounders' National Confederation at 100, St. Ermins, have now been changed to permanent premises at 2, Caxton Street (Second Floor), Westminster, S.W.1. (Telephone No., Abbey 2231.)

LORD BEAVERBROOK, the Minister of Supply, addressed a meeting of shop stewards of the Amalgamated Engineering Union in Glasgow on Sunday week. The meeting passed a resolution pledging an increase in munitions production.

HYDE PARK RAILINGS, which are to vanish in the interests of the war effort, are expected to provide about 1,000 tons of scrap metal. The St. James and Green Parks will add another 500 tons. Cox & Danks, Limited, are responsible for the removal of the railings, which are being taken down and transported at the rate of 70 tons a day.

A CASKET to be presented by Sheffield to Stalingrad, the steel city of Russia, was on view in the former city recently before being handed over. It is of stainless steel measuring 18½ in. by 12½ in. by 3½ in. Sheffield's coat-of-arms is embossed on a silver shield on the lid, and on either side of the shield are depicted the British Lion, rampant, and the Hammer and Sickle.

THE AMALGAMATED ENGINEERING UNION has launched a national campaign in support of its claim for 4d. an hour wage increase. Mr. Jack Tanner, president of the union, said last week that a wage increase would further the war effort, and it would not be in the interests of production if their claim were refused. He did not say that as a threat of "slowing down" or "ca' canny." There had been a shortage of skilled craftsmen because of low wages. The union's claim was heard by the National Arbitration Tribunal on December 8, the Tribunal deciding to issue its award in due course.

DR. E. W. SMITH, Director-General of Gas Supply to the Board of Trade and vice-chairman of the Heat Supplies Committee of the Cabinet Production Executive, and Mr. J. F. R. Ronca, a member of the staff of the Chief Officer to the Directorate of Gas Supply, visited Sheffield works recently and interviewed managements, under the guidance of Mr. Lewis Chapman, managing director of W. Jessop & Sons, Limited, steel manufacturers, a member of the Heat Supplies Committee, who is acting as adviser to industrial gas consumers and gas producers in Sheffield and district. It is hoped to effect a considerable saving of gas, consumption of which for industrial purposes has risen very considerably since the war.

A SECOND TRAINING COURSE for industrial accident prevention organisers, arranged by the Royal Society for the Prevention of Accidents on behalf of the Factory Department of the Ministry of Labour and National Service, is to be held at Balliol College, Oxford, from January 2 to 13, 1942. The syllabus covers every aspect of industrial accident prevention and over twenty lecturers will take part. All are acknowledged experts on their particular subjects and are drawn both from the Factory Department and from firms with extensive experience of accident prevention organisation. Particular efforts are directed to giving trainees a solid grounding in the now extensive technology of the subject as well as in organisation and the law. The course is residential; lodging and lectures thus being under one roof, the maximum amount of time can be given to intensive instruction. About 50 trainees, nominated by their employers, will be accommodated. Programme and syllabus on request from ROSPA, 52, Grosvenor Gardens, London, S.W.1

A DEPUTATION from the British Medical Association has presented to the Minister of Labour the report of a committee of the association which has been considering the question of an extension of industrial medical service. The report states that illness and accidents could be very much reduced if every factory, large or small, arranged for the medical care of the workers during working hours. Medical supervision means "a continuous supervision of the health of the individual worker in his industrial environment; the prevention so far as possible of physical and mental illness; a service for the initial treatment of injury; and an efficient medical liaison between the factory and outside medical services, such as the patient's own doctor, the hospital, the public health authority, and the rehabilitation services." The committee believes that large factories or factories with special risks would find the appointment of a whole-time industrial medical officer more efficient and economical. Small firms would appoint a part-time medical officer, or neighbouring firms could combine to make a joint whole-time appointment. An adequate medical service does not necessarily need an elaborate or expensive organisation, and is within the reach of small firms.

ABSENTEEISM, SICKNESS, "bottlenecks," Excess Profits Tax, and the reaction of the working-man to paying income tax were among the subjects considered at a meeting of the Teesside Chamber of Commerce recently. It was stated that the National Association had asked for the Chamber's views on these matters, and local firms had been circularised for their opinions. It was reported that absenteeism was prevalent among youths and girls chiefly owing to 12-hr. shifts, but there had been an improvement since working hours had been altered and arrangements made for workers to have two free Sundays out of three. There had been an increase in "bottlenecks," and one firm suggested that this was due to lack of co-operation and co-ordination on the part of Government departments. The labour position was becoming more difficult. The chairman, Major C. M. Spielman, referring to E.P.T., said the great proportion of work done was for the Government, and it was getting more difficult to reach a higher standard of profit. Mr. J. Wesley Brown said the working-man did not like paying income tax. E.P.T., he said, led to extravagance on the part of managements, and it was a mistake both from the financial and psychological points of view.

A MOBILE CORPS of highly skilled engineers, with the title of E.M.T.A.C. (Emergency Machine Tool Armament Corps), has been formed to go into factories where machine tools are idle and train men to use them. The corps was established because large numbers of machine tools were lying idle for want of operators. The deficiency may have been in machine setters or in operators. Some of the idle machines were of highly specialised types, and were without men to service them. The mobile corps includes both demonstrators and operators, and its members usually go in groups to works equipped with machines, but lacking the right kinds of labour, and train on the spot the semi-skilled men available. A considerable number of factories which were idle have been brought into production through the agency of this mobile corps, which at present consists of 200 men and will be expanded as required. Another step taken by the engineering employers in the interests of increased production is the establishment of eight regional committees to provide for the training of machine-tool setters, who will be available for employment anywhere they may be needed, and not only in the establishments where they are trained. This is a national scheme which will supply large numbers of skilled men.

New Company

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Built Metals—To build up articles to their original dimensions by electro-deposition or spraying; to adopt a licence by International Cordodeless, Limited, for the exploitation of that company's process for protecting metals against rust and corrosion, etc. £5.000. N. H. Kitchen and S. T. Roberts, 6, Bramley Road, London, N.14.

Personal

MR. J. E. MONTGOMREY is retiring next March from the secretaryship of the Institution of Mechanical Engineers and Dr. H. L. Guy, D.Sc., F.R.S., has been appointed to succeed him.

SIR HAROLD HARTLEY, F.R.S., past-president of the British Cast Iron Research Association and the Institute of Vitreous Enamellers, has been elected to an Honorary Fellowship at Balliol College.

MR. W. S. GALLIE, a former chairman of the Scottish Structural Steel Association, has been presented with his bust in bronze, executed by Benno Schotz, R.S.A. The presentation was made by Scottish structural engineers in recognition of his long services to the industry in Scotland. Mr. Gallie was instrumental in organising the Scottish Structural Steel Association, and he was chairman from its inception until 1939.

MR. H. B. ROBIN ROWELL, director of R. & W. Hawthorn Leslie & Company, Limited, Hebburn-on-Tyne, was elected president of the Shipbuilding Employers' Federation in succession to Mr. J. M. Ormston, at the Federation's annual meeting in Carlisle. Mr. Louis V. Dunlop, general manager of Harland & Wolff, Limited, Govan, Glasgow, becomes senior vice-president. A new vice-president is Mr. F. E. S. Beavan, manager of the Barr Graving Dock & Engineering Company, Limited.

Wills

LAWLEY, WILLIAM, of Great Barr, Staffs, retired ironfounder £40,3
HOLT, H., of Rochdale, chairman of Thomas Holt, Limited, machinery manufacturers £41,6
BIRCH, HARRY, of Streetly, Staffs, director of Malleable, Limited, Wisemore Foundry, Walsall £16,9
SWIFT, E. E., joint managing director of J. H. Swift & Sons, Limited, tool manufacturers, Sheffield £3,3
SIDDONS, JOSEPH R., of West Bromwich, joint managing director of J. & J. Siddons, Limited, ironfounders £4,3
DRANSFIELD, G. V., of Darton, Yorks, senior partner of J. Dransfield & Sons, foundry requisite manufacturers £2,6
PARTON, FRANK, of Glasgow, Scottish manager of E. Green & Son, Limited, fuel economiser manufacturers, of Wakefield £11,2
HOLCROFT, FREDERICK, chairman of Thomas Holcroft & Sons, Limited, ironfounders, Ettingshall Foundry, Wolverhampton ... £59,6
RAMSDEN, LORENZO, of Sheffield, for 30 years a representative of W. A. Tyzack & Company, Limited, steel and edge-tool manufacturers... £1,9
GIBB, D. MACCALLUM, of Farnham, formerly of Edgbaston, late director and general manager of the Parkinson Stove Company, Limited... £2,3
JACKSON, R. B., director of the Millom & Askam Hematite Iron Company, Limited, and the North Lonsdale Iron & Steel Company, Limited £67,6
BILLINGTON, G. M., of Wolstanton, a director of Billington & Newton, Limited, non-ferrous metal manufacturers and founders, Longport, Stoke-on-Trent £4,0

Obituary

MR. JOSEPH JAMES PITT, late of Frederick Brab & Company, Limited, died at his home in Glasgo on December 1.

MR. HENRY GRANVILLE SCOTT, blast-furnac manager at the Redcar Ironworks of Dorman, Lon & Company, Limited, died recently.

MAJOR JOSEPH SYDNEY WESSON has died in h 54th year. He was a director of W. Wesson Company, Limited, Victoria Ironworks, Moxle Wednesbury.

MR. FRANK ASHTON, manager and director John Heald, Limited, ironfounders, Chorley, Lanc died recently. He had been with the firm f nearly 50 years.

MR. A. HUMPHRIES, of Checketts Lan Worcester, has died at the age of 52 years. H had been associated with Metal Castings, Limite since 1920, and was previously with the Nevi Engineering Company, of Worcester.

MR. HAROLD HALL, who was well known in th Sheffield saw and file trade, died on Saturda November 29, at the age of 59. For over years he was connected with J. & Riley Car file manufacturers.

MR. GEORGE FREDERICK MULHERION died recent at Torquay. Over 80 years of age, he was mana ing director of the Tyne Iron Shipbuilding Co pany, Limited, Willington Quay, retiring when t yard was purchased by Sir Armstrong Whitwor & Company.

MR. HOWARD S. SIDDONS, a member of an o West Bromwich family, died at Aberdovey Saturday, November 15, aged 73. He was th eldest son of the late Mr. Joseph Heines Siddon and was principal director of the firm of J. & Siddons, Limited, ironfounders, West Bromwich.

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—but only one standard of quality
DURABLE refractory structures and linings of Silica Bricks demand a performance only possible from refractories which are consistently uniform in quality. To meet this fundamental requirement "G.R." impose a technical system of control at every stage of manufacture. That is why the characteristics for which G.R. Silica Bricks are famed—accuracy of shape and size, low porosity and resistance to erosion and corrosion, low after-expansion, good spalling resistance and so on —are built into every batch. Whether you require thousands of bricks or only a few special blocks, you can depend on maximum performance and structural life.
G.R. Silica Brick Works are situated in various parts of the country, in close proximity to the chief industrial areas. G.R. Brands include:—
LOWOOD. Made in one of the largest and most modernly equipped silica brick works in the world. Careful selection and blending of silica stone, mechanical grading and powerful presses are all factors in the manufacture of bricks able to withstand the severe conditions of modern furnace practice.
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Raw Material Markets

All deliveries of iron and steel are subject to the prior issue of licences, which are granted by the Control according to the purpose for which the supplies are required and also the supply position with regard to the various descriptions of iron and steel. Generally speaking, outputs are reserved for works engaged on contracts of national importance, but in the case of high-phosphorus pig-iron, for example, it is fairly easy to secure deliveries for stocking. Low- and medium-phosphorus irons and hematite continue to be carefully controlled, while the concentration of the steel industry on the production of special alloy qualities has greatly reduced the quantity of ordinary types of steel for distribution. The changed procedure in connection with the rebate schemes, recently announced, has now been generally applied, and the amount of the rebate is being deducted from the invoice in the case of pig-iron as well as steel.

Pig-Iron

MIDDLESBROUGH—Although slight delays are experienced in securing deliveries of high-phosphorus iron from the Midland furnaces, little, or no, inconvenience is felt by consumers on the North-East Coast, many of them having substantial reserve supplies on which to draw until fresh tonnages arrive. There is no chance now of there being a resumption of the manufacture of Cleveland foundry iron on any scale, as the furnaces in this district are fully committed in meeting the strong demand for basic, hematite, and other grades of iron used in the steelworks. Heavy foundries are still operating to capacity, but the position in the light-castings trade remains dull, with few prospects of additional orders being forthcoming while industry is on a war footing.

LANCASHIRE—There is a brisk demand for special refined qualities of iron, as these are being utilised in many instances to relieve the situation brought about by the shortage of hematite, deliveries of the latter being still of small extent and confined to buyers employed on vital war work. Refined iron is being acquired from Derbyshire producers, who report that orders from Lancashire are considerable. No. 3 foundry iron remains on the quiet side, as the consuming trades—the light-castings and jobbing foundries—are not being called upon to cope with war production to any great extent, while many of their ordinary outlets have closed up. It is possible to report a slight improvement in the position of a few jobbing foundries, but this has not affected the trade as a whole.

MIDLANDS—Supplies of high-phosphorus iron for the light foundry trade are good, and many consumers have been able to build up useful stocks, which are not likely to be drawn upon for some time to come, as business in this section is confined to a moderate amount of ordinary domestic trade, Government specifications being few and far between. A certain amount of high-phosphorus iron is being taken up by heavy engineering concerns, who are utilising this material as a substitute for other types of iron less easily obtained. Heavy engineering foundries are not in a position to accept much business outside that which they are carrying out for Government departments, as official contracts are sufficient to keep them fully occupied. Moderate tonnages of low- and medium-phosphorus iron are forthcoming, but hematite is distributed very sparingly, and the deficit is made up chiefly by the use of refined grades of pig-iron, which are fairly plentiful.

SCOTLAND—Rather better deliveries of foundry iron have been reported during the past few days, and a steady increase in the volume of iron despatched to local consumers is expected. Heavy engineers and marine founders are calling for very large supplies, being employed to capacity on vital contracts; there have been no instances of works' operations being disturbed by inadequate supplies of iron, although few works have any reserves. Quiet conditions continue to prevail among light-castings founders, who are able to secure all the iron they require from the English Midlands. Raw materials are arriving at the steelworks satisfactorily, although there is some difficulty in obtaining hematite, which is reserved for the most important work and is issued only when no other grade can be used.

Coke

Consumers of foundry coke are well placed, most of them having considerable stocks on hand. Coke ovens have been despatching supplies for stocking purposes throughout the summer months, so it would appear that requirements will be adequately covered during the winter, when there may be a tendency for deliveries to become less regular than they are at present.

Steel

From recent official statements it may be assumed that supplies of special alloy steels required for munitions production are coming forward in good tonnages. It is certain that much development has been achieved in production of these qualities, but the demand is ever increasing, and additional units will have to be transferred to the manufacture of alloy steels if all needs are to be met. The steel industry has made such rapid strides in recent months, however, that production of war materials is unlikely to be in any way held up by inadequate quantities of steel.

Scrap

Scrap metal is being used freely by the steelmakers. Imports are now at a low ebb, owing to the desire to conserve shipping space for cargoes of commodities which cannot be produced at all or in the necessary volume in this country. Most foundries are getting all the scrap they require, and some have appreciable stocks on hand.

Metals

COPPER—It would seem that the entry of Japan into hostilities with the United States and Great Britain will affect shipments of copper from these two countries to the Soviet Union, in so far as the route to Vladivostok must be made perilous by the presence of Japanese naval units in the Sea of Japan particularly. Thus greater reliance will have to be put on the communications with Russia via Archangel and Iran, while the Soviet successes against the Nazis would seem to have lessened the German threat in the region of the Caucasus. It must also be assumed that there will be some interference by the Japanese navy with shipments of Chilean copper to the United States, although such cargoes will doubtless be well protected by the American Navy.

The national emergency again precluded them from publishing information relating to their production and to the progress of their undertaking, said Mr. A. Chester Beatty (chairman) at the annual meeting of Roan Antelope Copper Mines, Limited, held in London recently. The amount required to meet the company's liabilities for taxation was £730,000, equivalent to 63 per cent. of their net profit. Mr. Beatty added that native labour still continued to seek employment at the mine in good numbers, but, owing to the demands of the war, there was a shortage of skilled white miners. Certain construction work of major importance was in progress, and was mainly connected with preparations for mining the large tonnage of ore which lies under the Luanshya River. Before this ore could be extracted, the river itself must be diverted.

TIN—The outbreak of war in the Pacific has naturally had widespread repercussions on the tin position and, in view of the possibility of tin supplies to this country and the United States being interfered with, it was not surprising that the tin market was one of the first in London to be affected by the Japanese action. At noon on Monday dealings were suspended pending the receipt of instructions from the Ministry of Supply. The Committee of the London Metal Exchange later the same day decided to fix official quotations, as follow:—Cash, £259 to £260 per ton; three months, £262 to £263; settlement, £259 10s. Sales on Monday amounted only to 75 tons, and the day's clearing was postponed until the following day. Dealings in tin have been suspended until further notice. The Exchange have submitted proposals to the Ministry of Supply for continuing trading in tin on the London market. There has been no market in Singapore this week.

Under the Control of Tin (No. 3) Order, 1941, which came into operation on Tuesday, any person holding any tin in the form of ingot, slab, block, bar, stick, grain tin, or granulated tin, other than a person carrying on an undertaking which involves the treatment, use, or consumption of such tin, is required to hold that tin at the disposal of the Ministry of Supply, and to send forthwith particulars of quantities, qualities, and location of his holding to the Joint Controllers of Non-ferrous Metals. This requirement applies both to tin situated in the United Kingdom, and to any tin which subsequently arrives in or is produced in the United Kingdom. Further, no person can acquire any tin in the above forms or tin scrap, ore, concentrate, residue, slag, dross, or sludges without a licence from the Minister, or dispose of such materials unless to the holder of a licence. All communications should be addressed to the Joint Controllers of Non-ferrous Metals, Grand Hotel, Rugby.

The capitulation of Thailand to Japanese pressure now puts an end to any prospects of the Thai Government deciding to continue to participate in the international tin restriction scheme. For a long time past Japanese interests have influenced Thailand's attitude to that scheme.

The Statistical Bulletin of the Tin Research Institute, Fraser Road, Greenford, Middlesex, controlled by the International Tin Research and Development Council, announces that world production of tin in October is estimated at 19,300 tons, compared with 22,200 tons in October, 1940. Production for the first ten months was 205,200 tons in 1941, against 187,600 tons in 1940. United States deliveries totalled 8,000 tons last October, against 12,715 tons in September. U.S. deliveries in the first ten months of 1941 were 127,287 tons, compared with 93,634 tons in the corresponding period of 1940. Tin consumption of the United Kingdom was 2,079 tons in August, 1941, against 2,418 tons in July, and 2,322 tons in August, 1940. World stocks of tin, including smelters' stocks and carry-over, increased by 4,736 tons during October last to 51,465 tons at the end of the month. Stocks at the end of October, 1940, were 53,890 tons.

SPELTER—Essential requirements of spelter in the United Kingdom are at a very high level, and permit of little being spared for ordinary domestic users. A proportion of the Empire output is being set aside for the use of the Russians and, as in the case of other non-ferrous metals future shipments will probably have to go by an alternative route to the Vladivostok line of supply. Zinc supplies in the United States are not at all plentiful, and distribution is very carefully regulated. Domestic output of zinc in Japan is well below her wartime needs, and she must now be relying on the fairly substantial stocks which she has amassed in recent years, as it is unlikely that she is free to import fresh supplies of metallic zinc and ores.

LEAD—Bigger quantities of lead are now being taken up by war industries, and non-priority consumers are coming up against increasing restrictions. Fortunately, ordinary requirements of this metal are not very pretentious at present.

SCRAP—Many difficulties are still facing non-ferrous scrap merchants, but the Control are taking steps to deal with the situation. It is hoped that the various methods which the Control are adopting will greatly assist the disposal of scrap metal.

Reduction of Vanadium Oxides

In "Uralskaja Metallurgija," MICHAILOW and STENGELMEIER deal with the carry-over of V from its oxides into the pig-iron and how this transition is affected by the temperature, basicity and amount of the slag. The higher V oxides are reduced to V_2O_3 by CO at 800 deg., further reduction to V_2O_2 taking place with charcoal at 1,200 deg. It appears this oxide is reduced to metal in the slag at 1,300 deg., the slag yield increasing with the slag basicity and with temperature rise. The V can volatilise at between 1,450 and 1,550 deg. Losses with an acid slag are greater than with a basic. The best method is to run a basic slag and a high temperature, when the slag yield is low.